Appendix A

Residue Collection and Transportation Cost Studies

APPENDIX A
RESIDUE COLLECTION AND TRANSPORTATION COST STUDIES

A.1 Rice Straw Collection Costs

Table A-1 compares the costs of various straw removal methods.[1] The least-cost options result in a narrow cost range of $19.20 to $19.60 to bale and roadside a ton of straw.[2] These estimates are supported by interviews with straw brokers. For example, one broker[3] reported that rates for rice straw removal range between $16 and $23 per ton, depending on the required collection effort and hauling distance to the roadside.

Table A-1

Current Costs for Straw Removal

	Yield (Tons/Ac)	Chop/Collect ($/Acre)	Bale ($/Ton)	Roadside ($/Ton)	Total ($/Ton)
UCD Coop Ext (85-110 lbs bales)					
Combine Chop,	3	$16.79	$14		$19.60
Combine Chop,	4	$21.54	$14		$19.39
Swath, Rake & Bale	3	$16.00	$14		$19.33
Swath, Rake & Bale	4	$20.75	$14		$19.19
Rudy Dyck Co. (1300 lbs bales)					
Swath & Bale <2mi	2.5		$18	$2	$20
Swath & Bale >5mi	2.5		$18	$5	$23
Rake & Bale <2mi	2.5	$2.54	$13	$2	$16
Rake & Bale >5mi	2.5	$2.54	$13	$5	$18

[1]Steve Blank, et. al., op. cit. Blank, et. al. assume that three to four tons per acre of rice straw remains after harvest. However, one broker found that between two to three tons of straw remains on each acre after harvest. (Rudy Dyck, Rudy Dyck Co., custom harvesting, personal communication, October 1992.)

[2]These costs are based on the smaller 80 to 110 pound bales preferred by agencies using the straw for erosion control or private animal husbandry concerns using it for bedding.

[3]Rudy Dyck of Winters, California. Mr. Dyck generally bales straw into 1,300 pound bales. This size bale is less costly to transport for bulk consumption as boiler fuel or animal feed, but more unwieldy to manage for on-site soil management or animal bedding.

While existing cost estimates are based on custom harvesters, future development of an after-market for rice straw could lead to increased field removal by farmers themselves or by outside contractors, thereby resulting in reduced costs due to economies of scale and increased pressure for equipment innovation. Table A-2 shows the calculated costs of straw removal from three studies. The estimated cost differences reflected in these studies generally arise from varying assumptions about equipment capacity.[4] In addition, the estimates are based on the assumption that existing equipment can be adapted to rice straw harvesting at a relatively low cost and that rice growers will either share the equipment with their neighbors or have large enough operations to sufficiently spread costs.[5] Based on these assumptions, in the long-term the costs for straw removal are estimated to fall to as low as $12.35 per ton.[6]

A.2 Transportation Costs to Central Processing Facility

The transport rates for agricultural residues reflect the current rates paid by hay and alfalfa growers are shown in Table A-3. Since hay and alfalfa are comparable to straw in density and composition, transportation rates for these crops are likely to be similar. These rates are expected to be typical for a residue disposal market if and when it becomes fully developed.[7] Although the large trucks typically used for agricultural products can carry up to 23 tons, this capacity is based on 125 pound bales, the typical weight for hay and alfalfa. Lower density straw bales of 80 to 110 pounds reduce the typical truck load to 15 to 20 tons. While trucking rates for agricultural commodities were deregulated by the California Public Utilities Commission (CPUC) in 1984, the historical rate structure remains relatively intact based on CPUC Tariff 14-A according to the San Joaquin Valley Hay Growers Association (SJVHG).

---

[4]The cost for baling and hauling equipment were drawn from a study on alfalfa hay harvesting equipment, while other costs come from the Blank, et. al. study rice straw incorporation study. S. Blank, K. Klonsky, K. Norris and S. Orloff, "Acquiring Alfalfa Hay Harvest Equipment: A Financial Analysis of Alternatives", Financial Management Topic Report No. 6, March 1992.

[5]As with most capital equipment purchases, absent some equipment cooperative, small operations will have a more difficult time financing new and expensive equipment than larger operations. This factor is reflected in both the financial and economic impact analysis.

[6]The SEPCO Project application to the California Energy Commission includes an estimate of equipment and effort required to collect, process and transport sufficient amounts of straw; the per unit costs were drawn from the UCD studies. SEPCO plans to pay all of the costs for straw removal. SEPCO Project, Submitted to California Energy Commission Docket Number 92-AFC-2, August, Section 5.

[7]Rick Staas, SJVHG, personal communication, October 1992.

TABLE A-2
STRAW REMOVAL FARM EQUIPMENT COSTS

Equipment	Investment/Year Price	Life	Depr.	Debt	Insrnc.	Taxes	Total	Operating/Hour Repairs	Fuel	Labor	Hrs/Yr	Ton/Hr	Hrs/Ac	Total Costs $/Hr	$/Acre	$/Ton
UCD Ag.Econ (1)	(=3-4 Tons/Acre)			8.8%				$10	$0.80	$10					**$37.04**	**$12.35**
HARVEST																
Combine Mtnd Chopper	$3,000	8	$338	$199	$8.25	$16.50	$561	$1.80	$0.00	$11.97	251		0.63	$16.00	$10.08	$3.36
Swather-14'	$52,500	10	$4,725	$3,479	$144.38	$288.75	$8,638	$3.43	$2.40	$11.40	67	18	0.17	$146.79	$24.47	$8.16
Tractor - 215hp	$126,500	10	$11,385	$8,384	$347.88	$695.75	$20,812	$10.54	$12.78		1235			$40.17		
Flail Chopper	$12,800	10	$1,152	$848	$35.20	$70.40	$2,106	$7.67	$0.00	$11.95	202	15	0.2	$30.07	$6.01	$4.68
Forage Chopper PTO	$34,000	7	$4,371	$2,253	$93.50	$187.00	$6,905	$13.61	$0.00	$12.06	285	9	0.35	$49.91	$17.47	$10.51
Forage Chopper SP	$130,500	7	$16,779	$8,649	$358.88	$717.75	$26,504	$39.48	$11.26	$12.06	298	9	0.35	$151.76	$53.12	$22.39
COLLECTING																
Tractor-60hp	$24,000	10	$2,160	$1,591	$66.00	$132.00	$3,949	$2.40	$3.02		1314			$8.43		
Rake 20'	$13,000	20	$585	$862	$35.75	$71.50	$1,554	$5.22	$0.00	$11.40	125	30	0.10	$29.05	$3.75	$1.25
Tractor-40hp	$20,000	10	$1,800	$1,326	$55.00	$110.00	$3,291	$1.55	$2.56		2000			$5.76		
Baler-Alfalfa	$36,000	10	$3,240	$2,386	$99.00	$198.00	$5,923	$32.94	$2.00	$11.88	630	12	0.25	$56.22	$14.06	$5.16
Bale Wagon	$74,000	10	$6,660	$4,904	$203.50	$407.00	$12,175	$5.36	$4.00	$11.88	630	18	0.17	$40.57	$6.76	$2.57
SEPCO Ethanol (2)	(=3 Tons/Acre)														**$61.80**	**$20.53**
Tractor-Harvester 112hp																
Tractor - 215hp	$126,500	10	$11,385	$8,384	$347.88	$695.75	$20,812	$10.54	$12.78		630	21	0.14	$56.35	$8.07	
Flail Chopper	$12,800	10	$1,152	$848	$35.20	$70.40	$2,106	$7.67	$0.00	$11.95	630	21	0.14	$22.96	$3.29	$3.79
Front Loader 65hp	$24,000	10	$2,160	$1,591	$66.00	$132.00	$3,949	$2.40	$3.02	$11.88	454	12	0.26	$26.00	$6.70	$2.23
Bale & Roadside																
Tractor-40hp	$20,000	10	$1,800	$1,326	$55.00	$110.00	$3,291	$2.40	$2.56		1385			$7.34		
Rake 20'	$13,000	20	$585	$862	$35.75	$71.50	$1,554	$5.22	$0.00	$11.40	125	30	0.1	$29.05	$2.91	$1.21
Baler-Alfalfa	$36,000	10	$3,240	$2,386	$99.00	$198.00	$5,923	$32.94	$2.00	$11.88	630	8	0.36	$56.22	$20.13	$7.58
Bale Wagon	$74,000	10	$6,660	$4,904	$203.50	$407.00	$12,175	$5.36	$4.00	$11.88	630	8	0.36	$40.57	$14.52	$5.72
UCD Ag.Eng. (3)	(=3 Tons/Acre)														**$57.00**	**$19.00**
Baling & Roadside																
Tractor-40hp	$20,000	10	$1,800	$1,326	$55.00	$110.00	$3,291	$2.40	$3.02		1314			$7.92		
Baler-Alfalfa	$36,000	10	$3,240	$2,386	$99.00	$198.00	$5,923	$32.94	$2.00	$11.88	630	6	0.5	$56.22	$28.11	$10.59
Bale Wagon	$74,000	10	$6,660	$4,904	$203.50	$407.00	$12,175	$5.36	$4.00	$11.88	630	7	0.43	$40.57	$17.39	$6.84
Frontloader-60hp	$24,000	10	$2,160	$1,591	$66.00	$132.00	$3,949	$2.40	$3.02	$11.88	1314	13	0.23	$20.31	$4.69	$1.56

(1) S.Blank, et al, "Rice Straw Incorporation Costs," FMTP #7, 9/92; S.Blank, et al, "Acquiring Alfalfa Hay Harvest Equipment:..." FMTP #6, 3/92.
(2) SEPCO Project 92-AFC-2, Submitted to CEC, 8/92, Section 5.
(3) B.M. Jenkins & G. Knutson, "Energy Balances in Biomass Handling Systems:..." Proc. ASAE, #84-3593.
All equipment investment costs and hourly labor rates based on S.Blank, et al (1); labor and usage intensity measures are from each respective source, (2) & (3).

Source: Foster Associates, Inc.

TABLE A-3

TRUCKING COSTS - STRAW, AG. WASTES & WOOD WASTE

Trip Miles		Minimum Weight ($/Ton)			
Over	Not Over	<10 Tons	10 Tons	15 Tons	20 Tons
CPUC Minimum Rate Tariff 14-A (June 12, 1982)*					
0	3	$15.60	$9.80	$6.20	$5.40
3	5	$16.00	$10.00	$6.60	$5.80
5	10	$16.60	$10.60	$7.00	$6.20
10	15	$17.00	$11.00	$7.60	$6.60
15	20	$17.60	$11.60	$8.00	$7.20
20	25	$18.20	$12.20	$8.40	$7.40
25	30	$19.00	$13.20	$9.20	$8.20
30	35	$19.20	$13.60	$9.80	$8.40
35	40	$20.20	$14.20	$10.00	$9.20
40	45	$20.80	$14.80	$10.60	$10.00
45	50	$21.60	$15.20	$11.00	$10.20
50	60	$23.20	$16.80	$12.40	$11.60
60	70	$24.20	$18.00	$13.00	$12.20
70	80	$25.20	$19.40	$13.60	$13.00
80	90	$26.40	$20.60	$14.40	$13.60
90	100	$27.60	$22.00	$14.80	$14.40
San Joaquin Valley Hay Growers - (Rick Staas)					
0	10				$8.00
10	40				$10.00
40	60				$11.00
60	70				$12.00
70	(S.F.)				$15.00
Long Haul Rates - (Bruce Strickland)					
100					$20.00
450	(L.A.)				$49.50

* - Deregulated 1984 - Used as guideline by haulers

The average transportation costs are for a size range of central processing facilities, assuming an equal proportion of straw is taken from each growing region and the average straw yield is three tons per acre. Table A-4 shows the rates in each of these bands and the associated average transportation costs.

TABLE A-4

AVERAGE TRANSPORTATION COSTS FOR PROCESSING FACILITY

Trip Mi. One-Way	$/Ton/Load Size[1]		Added Sq. Mi	Cumulative Tons[2]	Ave. $/Ton		Ave. Miles
	15 Tons	20 Tons			15 Tons	20 Tons	
3	$6.20	$5.40	9	12,960	$6.20	$5.40	2.5
5	$6.60	$5.80	16	36,000	$6.46	$5.66	4.0
10	$7.00	$6.20	84	156,960	$6.88	$6.08	7.8
15	$7.60	$6.60	141	360,000	$7.28	$6.37	11.5
20	$8.00	$7.20	259	732,960	$7.65	$6.79	15.3
25	$8.40	$7.40	366	1,260,000	$7.96	$7.05	19.0
30	$9.20	$8.20	534	2,028,960	$8.43	$7.48	22.8
35	$9.80	$8.40	691	3,024,000	$8.88	$7.79	26.5
40	$10.00	$9.20	909	4,332,960	$9.22	$8.21	30.3
45	$10.60	$10.00	1116	5,940,000	$9.59	$8.70	34.0
50	$11.00	$10.20	1384	7,932,960	$9.95	$9.07	37.8

[1]Based on CPUC Tariff 14A (1982)

[2]Assumes 75% of land in rice or wheat, yielding 3 tons/acre.

REVENUES AND COSTS FOR BIOMASS GENERATION

A.3 Potential and Existing Generation Capacity

Table A-5 shows the energy in each pound of crop residue, as well as the ash content. In the analysis presented here, straw is assumed to produce 6,500 Btu per pound and orchard prunings 8,000 Btu per pound.[8]

Table A-5
Agricultural Residue Energy Production Values

Product	Btu/Pound		Ash %
	HHV	LHV	
Rice Straw	6,931	6,448	14%
Wheat Straw	7,365	6,885	8%
Almond Prunings	8,414	7,874	1%
Walnut Prunings	8,197	7,657	2.5%

HHV: Higher Heating Value

LHV: Lower Heating Value (Net of Moisture)

Table A-6 shows the range of potential capacity additions based on varied assumptions about energy conversion efficiencies to electricity (heat rates), fuel heat content (Btu per pound) and tons of residue to be used.

[8]J. Knutson and G. Miller, *Agricultural Residues (Biomass) in California*, University of California Cooperative Extension Energy Publication Leaflet 21303, April 1982.

TABLE A-6

BIOMASS ELECTRICITY GENERATION RESIDUE USE*

Heat Rate (Btu/kWh)	*13,000*	*17,000*	*20,000*
MMBtu/MW-Yr*	85,410	111,690	131,400
	Tons/MW-Yr*		
	Tons	Tons	Tons
at 6,500 Btu/lb	6,570	8,592	10,108
at 7,000 Btu/lb	6,101	7,978	9,386
at 7,500 Btu/lb	5,694	7,446	8,760
at 8,000 Btu/lb	5,338	6,981	8,213
Capacity Required to Use Tons of Residue			
at 6,500 Btu/lb (Straw)	MW	MW	MW
200,000 tons	30	23	20
400,000 tons	61	47	40
600,000 tons	91	70	59
800,000 tons	122	93	79
1,000,000 tons	152	116	99
at 7,000 Btu/lb			
200,000 tons	33	25	21
400,000 tons	66	50	43
600,000 tons	98	75	64
800,000 tons	131	100	85
1,000,000 tons	164	125	107
at 7,500 Btu/lb			
200,000 tons	35	27	23
400,000 tons	70	54	46
600,000 tons	105	81	68
800,000 tons	140	107	91
1,000,000 tons	176	134	114
at 8,000 Btu/lb (Prunings)			
200,000 tons	37	29	24
400,000 tons	75	57	49
600,000 tons	112	86	73
800,000 tons	150	115	97
1,000,000 tons	187	143	122

* - Based on 75% capacity factor for 1 MW-Year (= 6.57 GWh)

Table A-7 lists existing biomass projects that have the potential to burn agricultural wastes as feedstock, either straw or orchard prunings. Projects actually using agricultural residue as fuel are listed first.

A.4 Projected Payments and Economic Feasibility for Biomass Generators

Figure A-1 shows that the avoided-cost payment forecasts -- combined capacity and energy -- for the PG&E service area based on projected costs of short-term incremental energy additions. The price being paid to ISO #4 contracts by PG&E is shown on the top line. It falls substantially at the turn of the century as the energy payment reverts to short-run avoided costs (SRAC).[9] While the two CEC forecasts show differences of up to two cents per kilowatt-hour (kWh), they both remain substantially below the ISO #4 price guarantees made in 1982. In Figure A-2 which shows avoided-cost projections for SMUD, the SMUD Avoided Cost Study (ACS) calculates a higher capacity price for its resources due to the provisions in its contracts with PG&E and Southern California Edison (SCE).[10] While SMUD's ACS avoided cost forecasts show higher electricity prices than PG&E's forecast, these estimates are still substantially lower that payments under ISO #4.

An alternative method for determining avoided costs is to pay rates based on identified deferrable resources (IDRs) which represent least-cost long-term system additions. However, for Northern California utilities, these IDR's are needed only after the 2000 according to the CEC's 1992 Electricity Report (ER92). As indicated in Figures A-3 and A-4, for either investor-owned or municipal utilities, a natural-gas fired combined cycle unit appears to be the preferred choice for additional generating capacity in the near-term.[11]

Tables A-8 and A-9 show prices for straw and orchard waste, respectively, with avoided cost payments by PG&E and SMUD. As indicated in the tables, **under almost every single forecasting scenario netback prices for agricultural residues are negative**. The one primary exception is forecasted prices under SMUD's ACS-High scenario, but even under this forecast netback prices do not reach ISO #4 levels until 2010. Tables A-10 and A-11 show the negative netback prices forecasted under IDR-based payments.

---

[9]The price trajectory shown here is for a plant which has signed a 20-year contract and came on line in 1991. The actual results will vary between operating facilities.

[10]The variation in the lower and upper bound stems from assumptions related to both higher energy prices and earlier requirements for adding new resources. The CEC forecast generally lies within the SMUD range.

[11]Excluding any additional costs imposed by environmental "adders," or the Clinton Administration's proposed energy tax, which might be used to give alternative energy sources a more level playing field.

TABLE A-7
ONLINE NORTHERN CALIFORNIA BIOMASS PROJECTS

PG&E No.	Project	Location	APCD	S.O.	Size (MW)	Operation Date	Fuel
25C021	Auberry Energy	Auberry (Fresno)	SJV-S	4	7.5	01/07/86	Wood/Shells
12C008	Bohemia/Sierra Pacific	Lincoln (Placer)	Placer	4	7.5	06/03/86	Wood/Shells
06C062	Calif. Almond Growers	Sacramento	Sacto	=2	10.5	12/18/81	Shells
25P023	Chowchilla Biomass II	Chowchilla	SJV-N	4	9.9	02/16/90	Ag.Waste
SCE	DEI Co-Agri Inc.	Shafter (Kern)	SJV-S		5.0	11/01/85	Wood/Ag.
SCE	Delano Energy/Thermoelectron	Kern	SJV-S	4	31.0	1990	Wood/Ag.
16C088	Diamond Walnut Growers	Stockton	SJV-N	=2	4.5	11/25/80	Shells
25C007	Dinuba Energy	Dinuba (Tulare)	SJV-S	4	11.5	10/03/85	Wood/Ag.
25P031	El Nido	El Nido (Merced)	SJV-C	4	9.9	10/15/86	Ag.Waste
12C003	Energy Factors/Feather R.	Marysville	Yuba	4	18.0	11/24/86	Wood/Ag.
25C013	Mendota Biomass Power	Mendota	SJV-C	4	25.0	06/29/89	Ag.Waste
25C131	North Fork Energy	N.Fork (Madera)	SJV-N	4	9.0	12/15/87	Wood/Ag.
25P025	SJV Energy - Madera	Firebaugh	SJV-C	4	20.0	07/18/89	Ag.Waste
16P054	Tracy Biomass	Tracy	SJV-N	4	21.0	04/26/90	Ag.Waste
15P028	Ultrapower	Rocklin	Placer	4	25.0	06/09/89	Wood/Ag.
25P026	Ultrapower	Fresno	SJV-C	4	26.5	07/20/88	Wood/Ag.
12P018	Wadham Energy	Williams	Colusa	4	26.5	03/24/89	Rice Hl/Str
06P022	Woodland Biomass	Woodland	Yolo	4	25.0	08/31/89	Wood/Hulls
13C038	Burney Forest Prod.	Burney (Shasta)	NC	4	31.0	10/17/89	Wood
13P118	Burney Mountain Power	Burney (Shasta)	Shasta	4	9.8	08/15/84	Wood
10C003	Collins Pine Co. II	Chester	NS	2	12.0	04/04/84	Wood
19P005	Fairhaven Power Co.	Fairhaven (Humboldt)	NC	4	17.3	09/15/86	Wood
16C090	Fibreboard	Standard (Toulumne)	Sierra	3	3.0	06/26/82	Wood
04P010	Georgia Pacific	Fort Bragg	NC	3	15.0	06/01/80	Wood
10P005	Honey L. Hybrid Geo Prd.	Wendel (Lassen)	Lassen	4	32.0	07/26/89	Wood
13C111	Hudson Lumber Co.	Anderson (Shasta)	Shasta	2	6.0	09/13/82	Wood
00C009	Jeld-Wen	Susanville	Lassen	1	1.0	04/11/84	Wood
12C051	Koppers Co.	Oroville	Butte	2	6.0	07/01/83	Wood
19C003	Louisiana Pacific	Samoa (Humboldt)	NC	=4	47.5	01/01/77	Wood
16C006	Martell Cogen.	Martell (Amador)	Sierra	4	18.0	03/13/86	Wood
10P001	Mt. Lassen Power	Westwood (Lassen)	Lassen	4	10.5	10/11/84	Wood
19C010	Pacific Lumber	Scotia	NC	1	20.0	01/08/86	Wood
12P001	Pacific Oroville Power	Oroville	Butte	4	18.0	09/26/85	Wood
Redding	Redding Power Joint Ven.	Redding	Shasta	Muni	30	Pending	Gas (Wood)
13C083	Roseburg Lumber Co.	Anderson (Shasta)	Shasta	1	3.0	07/07/80	Wood
10C009	Sierra Pacific	Susanville	Lassen	=4	15.0	10/05/81	Wood
13C002	Sierra Pacific	Hayfork (Trinity)	NC	2	9.0	01/05/85	Wood
10C018	Sierra Pacific	Quincy	NS	4	20.0	01/14/83	Wood
13C049	Sierra Pacific	Burney (Shasta)	Shasta	4	20.0	11/04/86	Wood
13P045	Signal Energy Systems	Cottonwood (Shasta)	Shasta	4	54.9	10/30/87	Wood
19C034	Simpson Paper	Fairhaven (Humboldt)	NC	3	27.9	08/23/82	Wood
18P025	Soledad Energy Prtnshp	Soledad	Monterey	4	12.0	12/22/89	Wood
19P001	Ultrapower	Blue Lake (Humboldt)	NC	4	11.4	07/03/85	Wood
	Total-Ag.Waste*	18			293.3		
	Total-Biomass	43			743.5		

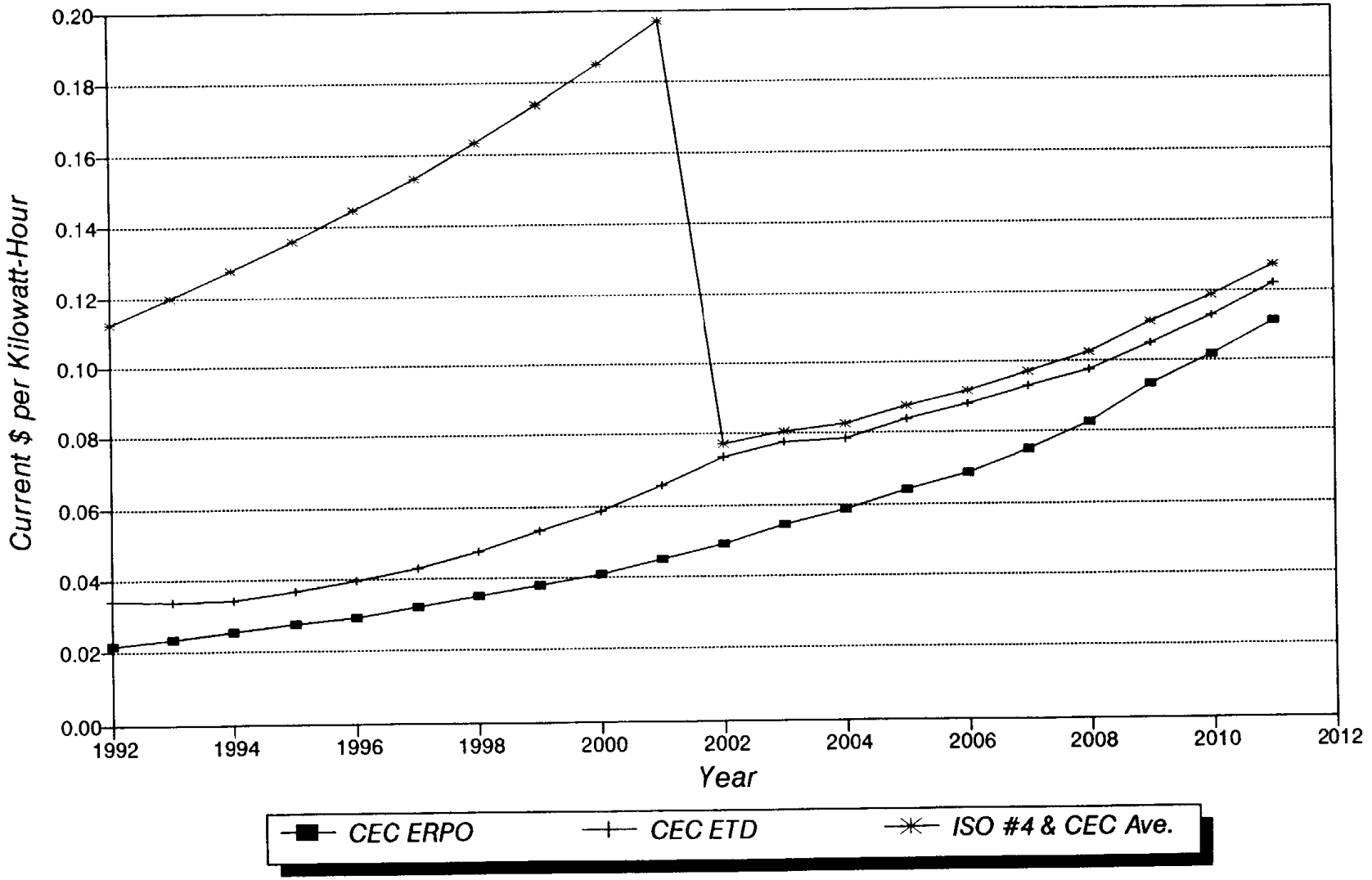
Source: PG&E Quarterly Reports (unless noted otherwise) /APCDs

Source: Foster Associates, Inc.

Figure A-1

PG&E Avoided Cost Forecasts

CEC and Interim S.O. #4

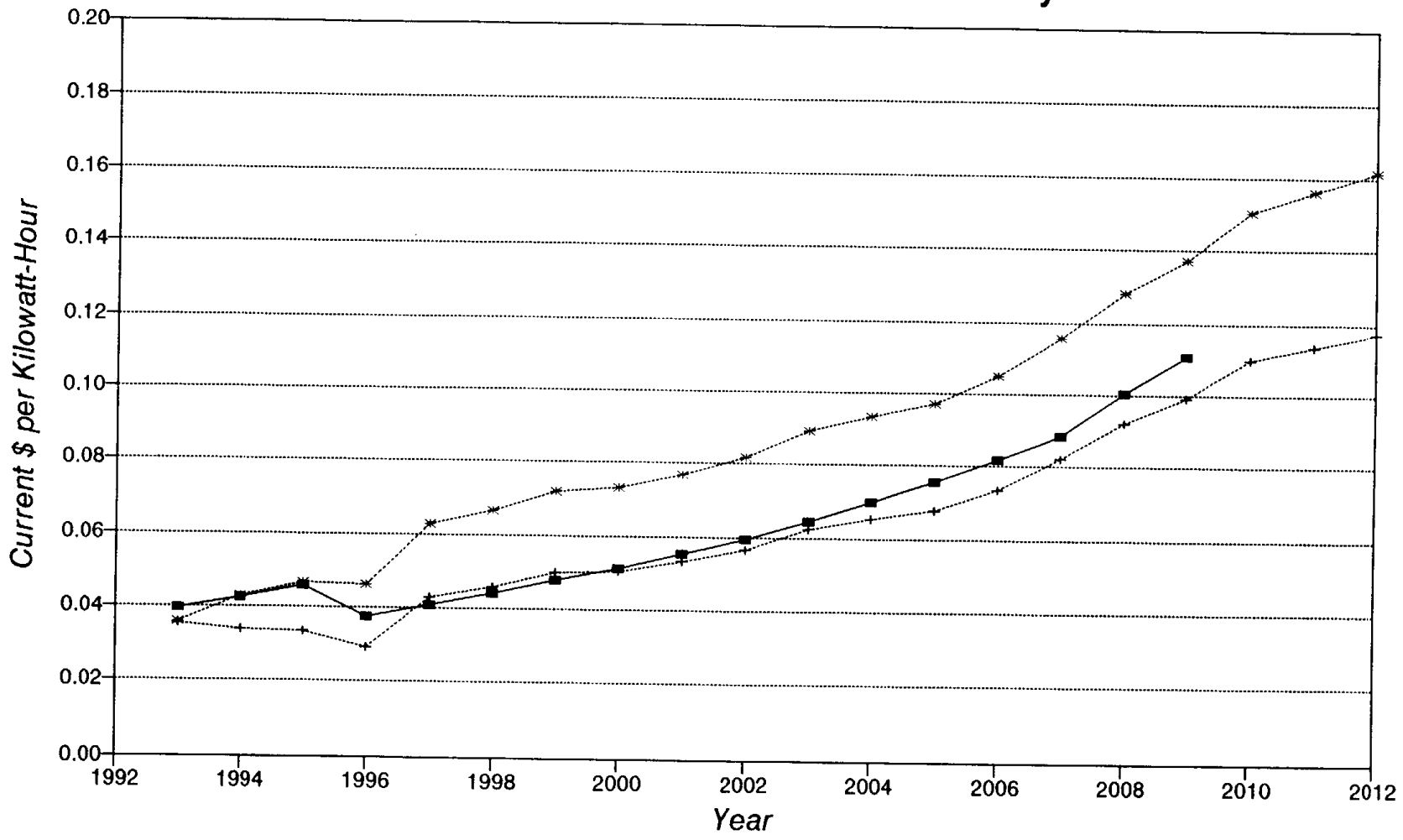


Source: Foster Associates, Inc

Figure A-2

SMUD Avoided Cost Forecasts

CEC and SMUD Avoided Cost Study

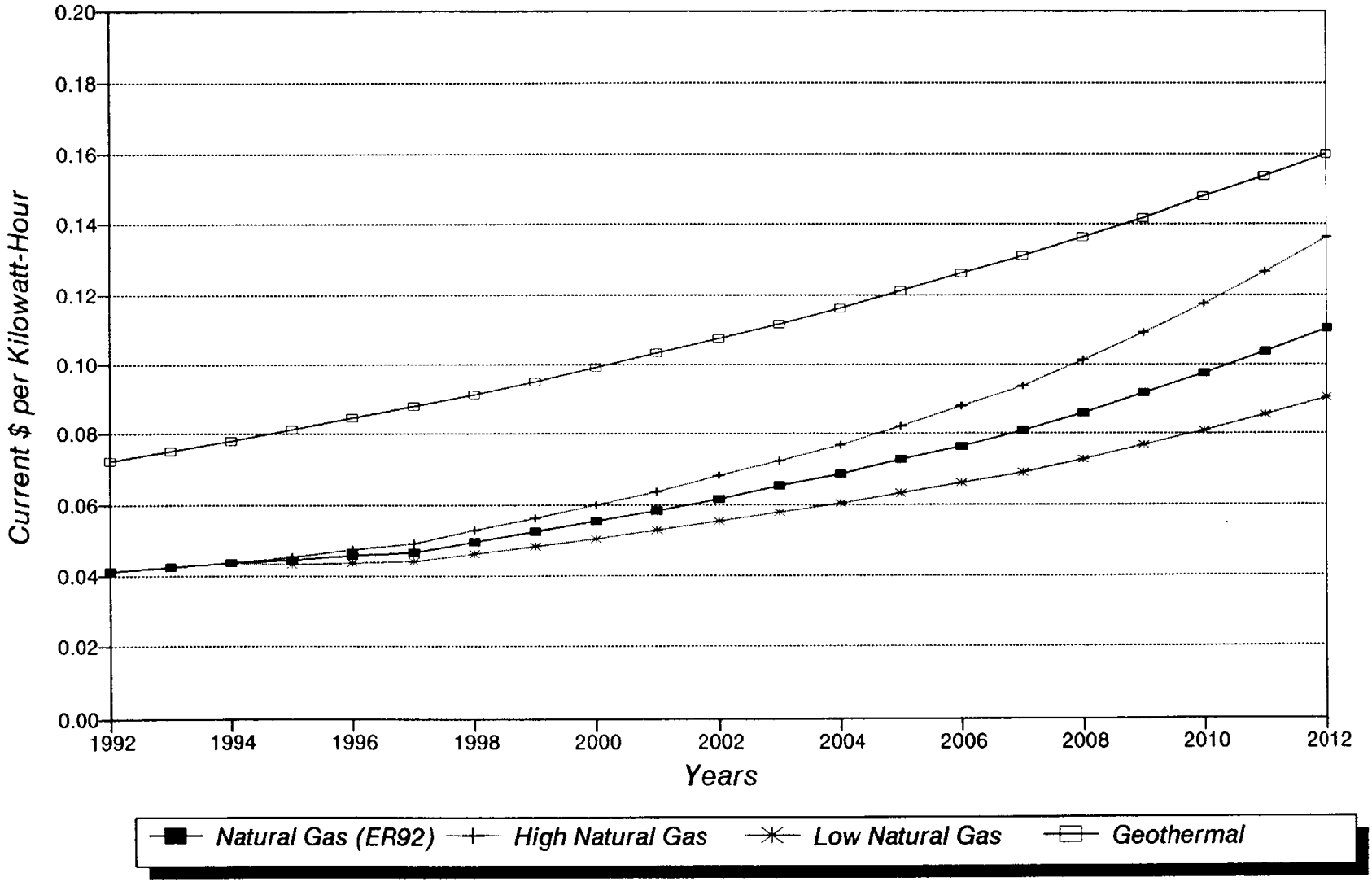


Source: Foster Associates, Inc

Figure A-3

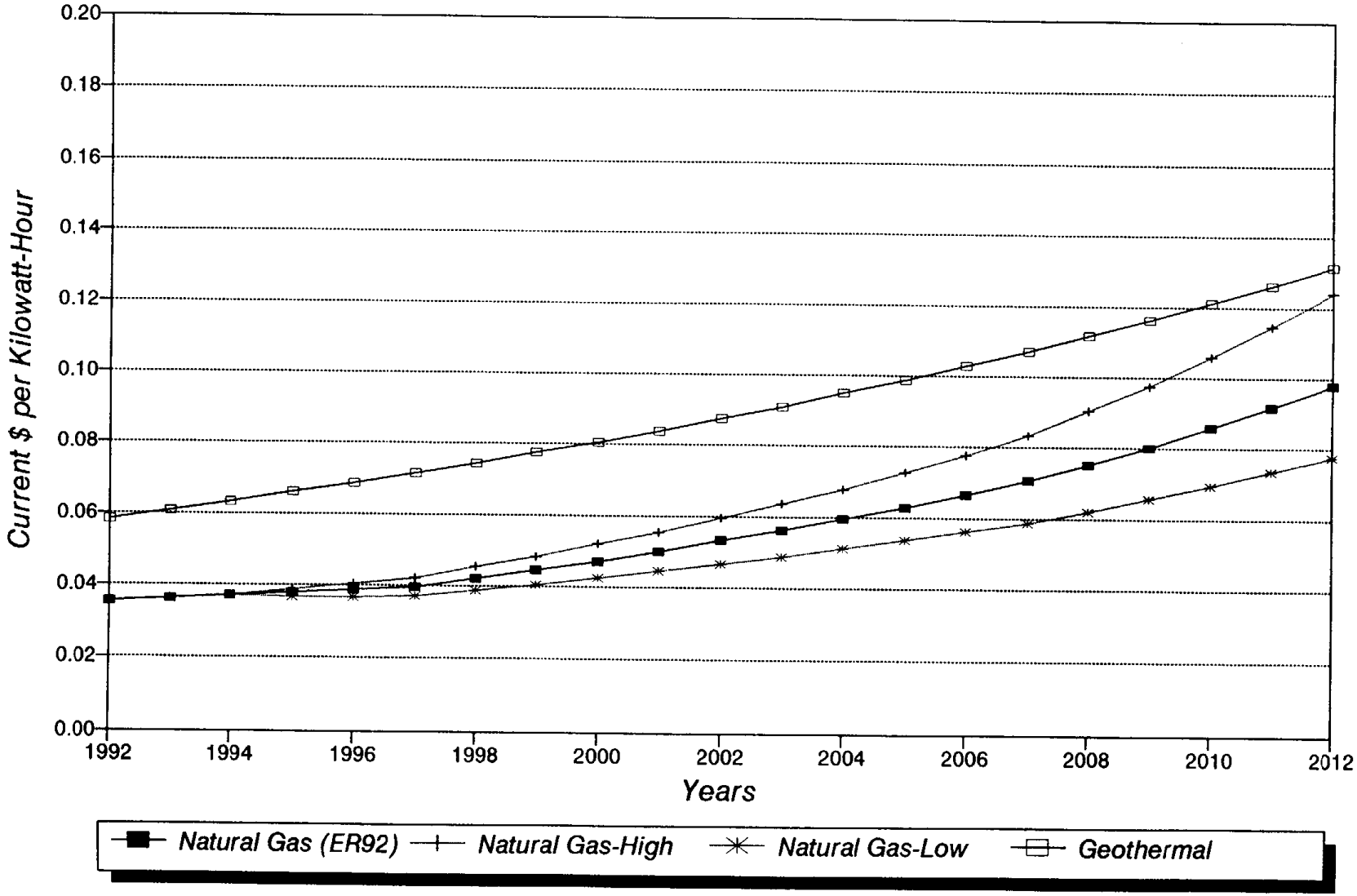
Avoided Cost Forecasts

IOU IDRs - Gas-fired, Geothermal



Source: Foster Associates, Inc

Figure A-4
Avoided Cost Forecasts
Municipal IDRs - Gas-fired, Geothermal



Source: Foster Associates, Inc

TABLE A-8
NETBACK STRAW BIOMASS FUEL PRICES ($/Ton @ 6500 Btu/lb)

Owner	PG&E		SMUD			QF to PG&E			QF to SMUD		
	Avoided Cost Forecasts		Avoided Cost Forecasts			Avoided Cost Forecasts			Avoided Cost Forecasts		
Scenario	CEC ERPO	CEC ETD	CEC ERPO	ACS Low	ACS High	CEC ERPO	CEC ETD	ISO #4	CEC ERPO	ACS Low	ACS High
1992	($37.26)	($27.92)				($46.67)	($37.33)	$22.31			
1993	($38.21)	($30.42)	($14.40)	($17.37)	($17.07)	($47.97)	($40.18)	$25.33	($35.81)	($38.78)	($38.48)
1994	($39.15)	($32.32)	($14.08)	($20.71)	($13.83)	($49.28)	($42.45)	$28.73	($36.30)	($42.93)	($36.05)
1995	($40.00)	($32.87)	($13.51)	($22.83)	($12.92)	($50.52)	($43.38)	$32.42	($36.58)	($45.90)	($35.99)
1996	($41.00)	($33.21)	($21.69)	($28.04)	($15.10)	($51.92)	($44.13)	$36.00	($45.63)	($51.98)	($39.04)
1997	($41.46)	($33.36)	($21.32)	($19.73)	($4.54)	($52.79)	($44.69)	$39.84	($46.17)	($44.58)	($29.39)
1998	($42.00)	($32.39)	($21.02)	($19.80)	($3.91)	($53.76)	($44.15)	$44.09	($46.82)	($45.60)	($29.71)
1999	($42.78)	($31.02)	($20.35)	($19.03)	($2.07)	($54.98)	($43.23)	$48.66	($47.13)	($45.80)	($28.85)
2000	($43.20)	($29.65)	($20.35)	($21.05)	($3.67)	($55.88)	($42.32)	$53.79	($48.14)	($48.85)	($31.47)
2001	($43.41)	($27.54)	($19.74)	($21.35)	($3.11)	($56.56)	($40.69)	$59.39	($48.59)	($50.20)	($31.96)
2002	($43.36)	($24.84)	($19.21)	($21.34)	($2.06)	($57.01)	($38.50)	($35.54)	($49.16)	($51.29)	($32.01)
2003	($42.63)	($24.95)	($18.09)	($19.62)	$0.99	($56.80)	($39.12)	($36.69)	($49.18)	($50.71)	($30.10)
2004	($42.74)	($27.64)	($16.77)	($20.27)	$1.32	($57.45)	($42.35)	($39.29)	($49.03)	($52.54)	($30.94)
2005	($42.24)	($27.16)	($15.39)	($21.36)	$1.04	($57.50)	($42.43)	($39.58)	($48.88)	($54.85)	($32.45)
2006	($42.71)	($27.76)	($13.73)	($19.93)	$3.93	($58.56)	($43.61)	($40.85)	($48.50)	($54.70)	($30.83)
2007	($41.42)	($28.13)	($11.86)	($16.68)	$8.96	($57.87)	($44.58)	($41.41)	($47.94)	($52.77)	($27.12)
2008	($40.08)	($28.51)	($6.13)	($12.43)	$15.05	($57.16)	($45.59)	($41.79)	($43.58)	($49.88)	($22.41)
2009	($36.00)	($27.24)	($1.51)	($10.59)	$18.52	($53.73)	($44.96)	($40.30)	($40.39)	($49.47)	($20.36)
2010	($34.30)	($25.61)		($5.96)	$25.10	($52.69)	($44.01)	($39.51)		($46.32)	($15.26)
2011	($31.48)	($23.46)		($6.72)	$25.68	($50.58)	($42.56)	($38.41)		($48.61)	($16.21)
2012	($121.13)	($121.13)		($7.86)	$25.92					($51.34)	($17.56)

Biomass based on CEC TCR (ER92) & ETSR (ER90), SMUD ACS (7/92)

CEC ERPO - Electricity Resource Planning Office 7/23/91

CEC ETD - Energy Technology Development 10/91

ACS - SMUD Avoided Cost Study 7/92

Source: Foster Associates, Inc.

TABLE A-9
NETBACK ORCHARD & WOODWASTE BIOMASS FUEL PRICES ($/Ton @ 8000 Btu/lb)

Owner	PG&E		SMUD			QF to PG&E			QF to SMUD		
	Avoided Cost Forecasts		Avoided Cost Forecasts			Avoided Cost Forecasts			Avoided Cost Forecasts		
Scenario	CEC ERPO	CEC ETD	CEC ERPO	ACS Low	ACS High	CEC ERPO	CEC ETD	ISO #4	CEC ERPO	ACS Low	ACS High
1992	($45.86)	($34.37)				($57.43)	($45.94)	$27.46			
1993	($47.02)	($37.44)	($17.72)	($21.38)	($21.01)	($59.03)	($49.45)	$31.24	($44.07)	($47.73)	($47.36)
1994	($48.18)	($39.78)	($17.32)	($25.48)	($17.02)	($60.65)	($52.25)	$35.36	($35.17)	($43.33)	($34.86)
1995	($49.23)	($40.45)	($16.63)	($28.10)	($15.90)	($62.18)	($53.40)	$39.90	($35.12)	($46.59)	($34.40)
1996	($50.46)	($40.88)	($26.69)	($34.51)	($18.58)	($63.90)	($54.31)	$44.31	($45.86)	($53.67)	($37.75)
1997	($51.03)	($41.05)	($26.23)	($24.28)	($5.59)	($64.98)	($55.00)	$49.03	($46.09)	($44.14)	($25.45)
1998	($51.69)	($39.86)	($25.88)	($24.37)	($4.82)	($66.16)	($54.34)	$54.26	($46.46)	($44.95)	($25.40)
1999	($52.65)	($38.18)	($25.05)	($23.42)	($2.55)	($67.67)	($53.21)	$59.89	($46.37)	($44.74)	($23.87)
2000	($53.17)	($36.49)	($25.04)	($25.91)	($4.52)	($68.77)	($52.09)	$66.20	($47.14)	($48.01)	($26.62)
2001	($53.43)	($33.89)	($24.29)	($26.27)	($3.83)	($69.62)	($50.08)	$73.09	($47.19)	($49.17)	($26.73)
2002	($53.36)	($30.58)	($23.65)	($26.27)	($2.54)	($70.17)	($47.38)	($43.75)	($47.37)	($50.00)	($26.27)
2003	($52.46)	($30.71)	($22.27)	($24.15)	$1.22	($69.90)	($48.15)	($45.16)	($46.85)	($48.74)	($23.37)
2004	($52.61)	($34.01)	($20.64)	($24.95)	$1.63	($70.71)	($52.12)	($48.36)	($46.11)	($50.43)	($23.85)
2005	($51.98)	($33.43)	($18.94)	($26.29)	$1.28	($70.78)	($52.23)	($48.72)	($45.34)	($52.69)	($25.12)
2006	($52.57)	($34.16)	($16.90)	($24.53)	$4.84	($72.07)	($53.67)	($50.27)	($44.25)	($51.88)	($22.51)
2007	($50.98)	($34.62)	($14.59)	($20.53)	$11.03	($71.23)	($54.87)	($50.97)	($42.93)	($48.87)	($17.31)
2008	($49.33)	($35.09)	($7.54)	($15.29)	$18.52	($70.35)	($56.11)	($51.43)	($36.90)	($44.65)	($10.83)
2009	($44.31)	($33.53)	($1.86)	($13.04)	$22.80	($66.12)	($55.34)	($49.60)	($32.27)	($43.45)	($7.62)
2010	($42.21)	($31.52)		($7.34)	$30.89	($64.86)	($54.17)	($48.62)		($38.85)	($0.62)
2011	($38.74)	($28.87)		($8.27)	$31.61	($62.25)	($52.38)	($47.28)		($40.92)	($1.04)
2012				($9.67)	$31.91					($43.49)	($1.91)

Biomass based on CEC TCR (ER92) & ETSR (ER90), SMUD ACS (7/92)

CEC ERPO - Electricity Resource Planning Office 7/23/91

CEC ETD - Energy Technology Development 10/91

ACS - SMUD Avoided Cost Study 7/92

Source: Foster Associates, Inc.

TABLE A-10
IDR NETBACK STRAW BIOMASS FUEL PRICES ($/Ton @ 6500 Btu/lb)

Owner	IOU				Municipal				QF to IOU				QF to Municipal			
IDR	Combined Cycle			Geothermal	Combined Cycle			Geothermal	Combined Cycle			Geothermal	Combined Cycle			Geothermal
Scenari	ER92 Gas$	High Gas$	Low Gas$	ER92	ER92 Gas$	High Gas$	Low Gas$	ER92	ER92 Gas$	High Gas$	Low Gas$	ER92	ER92 Gas$	High Gas$	Low Gas$	ER92
1992	($16.38)	($16.38)	($16.38)	$7.15	($10.88)	($10.88)	($10.88)	$6.74	($24.79)	($24.79)	($24.79)	($1.26)	($29.32)	($29.32)	($29.32)	($11.70)
1993	($17.44)	($17.44)	($17.44)	$7.42	($11.73)	($11.73)	($11.73)	$6.99	($26.17)	($26.17)	($26.17)	($1.31)	($30.87)	($30.87)	($30.87)	($12.15)
1994	($18.55)	($18.55)	($18.55)	$7.70	($12.63)	($12.63)	($12.63)	$7.25	($27.61)	($27.61)	($27.61)	($1.36)	($32.49)	($32.49)	($32.49)	($12.62)
1995	($19.90)	($19.26)	($20.80)	$7.99	($13.75)	($13.11)	($14.64)	$7.52	($29.30)	($28.67)	($30.20)	($1.42)	($34.37)	($33.73)	($35.27)	($13.10)
1996	($21.36)	($20.14)	($22.79)	$8.29	($14.97)	($13.75)	($16.40)	$7.80	($31.12)	($29.90)	($32.55)	($1.47)	($36.38)	($35.16)	($37.81)	($13.60)
1997	($22.83)	($21.04)	($24.75)	$8.60	($16.20)	($14.41)	($18.12)	$8.10	($32.96)	($31.17)	($34.88)	($1.54)	($38.42)	($36.63)	($40.34)	($14.12)
1998	($23.22)	($20.65)	($25.76)	$8.92	($16.34)	($13.77)	($18.88)	$8.40	($33.74)	($31.17)	($36.28)	($1.60)	($39.40)	($36.83)	($41.94)	($14.67)
1999	($23.56)	($20.54)	($26.61)	$9.25	($16.42)	($13.40)	($19.46)	$8.71	($34.48)	($31.46)	($37.52)	($1.66)	($40.36)	($37.34)	($43.41)	($15.23)
2000	($23.92)	($20.38)	($27.49)	$9.60	($16.50)	($12.97)	($20.08)	$9.04	($35.25)	($31.71)	($38.82)	($1.73)	($41.35)	($37.82)	($44.93)	($15.81)
2001	($24.24)	($20.12)	($28.40)	$9.96	($16.54)	($12.42)	($20.71)	$9.38	($36.00)	($31.88)	($40.16)	($1.80)	($42.33)	($38.22)	($46.50)	($16.42)
2002	($24.52)	($19.72)	($29.38)	$10.33	($16.53)	($11.73)	($21.39)	$9.73	($36.72)	($31.93)	($41.58)	($1.88)	($43.30)	($38.51)	($48.16)	($17.05)
2003	($24.82)	($19.30)	($30.41)	$10.71	($16.53)	($11.01)	($22.12)	$10.09	($37.49)	($31.97)	($43.08)	($1.96)	($44.32)	($38.80)	($49.91)	($17.70)
2004	($25.27)	($18.86)	($31.57)	$11.12	($16.66)	($10.26)	($22.96)	$10.47	($38.42)	($32.02)	($44.72)	($2.04)	($45.51)	($39.10)	($51.81)	($18.38)
2005	($25.46)	($18.01)	($32.58)	$11.53	($16.53)	($9.07)	($23.65)	$10.86	($39.12)	($31.66)	($46.23)	($2.12)	($46.48)	($39.02)	($53.59)	($19.09)
2006	($25.69)	($17.09)	($33.70)	$11.96	($16.42)	($7.81)	($24.42)	$11.26	($39.87)	($31.26)	($47.87)	($2.21)	($47.50)	($38.90)	($55.51)	($19.82)
2007	($25.85)	($15.92)	($34.83)	$12.41	($16.22)	($6.30)	($25.21)	$11.68	($40.56)	($30.63)	($49.54)	($2.30)	($48.49)	($38.56)	($57.47)	($20.58)
2008	($25.53)	($14.01)	($35.71)	$12.87	($15.53)	($4.02)	($25.71)	$12.12	($40.80)	($29.28)	($50.97)	($2.40)	($49.03)	($37.51)	($59.20)	($21.37)
2009	($25.14)	($11.88)	($36.42)	$13.35	($14.77)	($1.51)	($26.05)	$12.57	($40.99)	($27.73)	($52.27)	($2.50)	($49.53)	($36.28)	($60.81)	($22.19)
2010	($24.58)	($9.33)	($37.08)	$13.85	($13.81)	$1.44	($26.31)	$13.04	($41.03)	($25.78)	($53.53)	($2.60)	($49.90)	($34.65)	($62.40)	($23.04)
2011	($23.90)	($6.40)	($37.73)	$14.37	($12.72)	$4.78	($26.55)	$13.53	($40.97)	($23.48)	($54.81)	($2.71)	($50.18)	($32.68)	($64.01)	($23.93)
2012	($23.11)	($3.08)	($38.39)	$14.91	($11.51)	$8.52	($26.79)	$14.03	($40.83)	($20.81)	($56.12)	($2.82)	($50.39)	($30.36)	($65.67)	($24.85)

IDR - Identified Deferrable Resource (BRPU/ER92)

Plant costs based on CEC TCR (ER92) & ETSR (ER90), SMUD ACS (7/92)

Natural Gas Prices: ER92 w/Delphi VI variance

Source: Foster Associates, Inc.

TABLE A-11
IDR NETBACK ORCHARD & WOOD WASTE BIOMASS FUEL PRICES ($/Ton @ 8000 Btu/lb)

Owner	IOU				Municipal				QF to IOU				QF to Municipal			
IDR	Combined Cycle			Geothermal	Combined Cycle			Geothermal	Combined Cycle			Geothermal	Combined Cycle			Geothermal
Scenari	ER92 Gas$	High Gas$	Low Gas$	ER92	ER92 Gas$	High Gas$	Low Gas$	ER92	ER92 Gas$	High Gas$	Low Gas$	ER92	ER92 Gas$	High Gas$	Low Gas$	ER92
1992	($20.16)	($20.16)	($20.16)	$8.80	($13.39)	($13.39)	($13.39)	$8.29	($30.51)	($30.51)	($30.51)	($1.54)	($36.09)	($36.09)	($36.09)	($14.40)
1993	($21.46)	($21.46)	($21.46)	$9.13	($14.44)	($14.44)	($14.44)	$8.60	($32.21)	($32.21)	($32.21)	($1.61)	($37.99)	($37.99)	($37.99)	($14.96)
1994	($22.84)	($22.84)	($22.84)	$9.47	($15.54)	($15.54)	($15.54)	$8.93	($33.98)	($33.98)	($33.98)	($1.67)	($39.99)	($39.99)	($39.99)	($15.53)
1995	($24.49)	($23.71)	($25.60)	$9.83	($16.92)	($16.14)	($18.02)	$9.26	($36.06)	($35.28)	($37.17)	($1.74)	($42.30)	($41.52)	($43.41)	($16.12)
1996	($26.29)	($24.78)	($28.05)	$10.20	($18.43)	($16.92)	($20.19)	$9.61	($38.30)	($36.79)	($40.06)	($1.81)	($44.78)	($43.27)	($46.53)	($16.74)
1997	($28.10)	($25.89)	($30.46)	$10.58	($19.94)	($17.74)	($22.30)	$9.96	($40.57)	($38.36)	($42.93)	($1.89)	($47.29)	($45.08)	($49.65)	($17.38)
1998	($28.58)	($25.42)	($31.71)	$10.97	($20.11)	($16.95)	($23.24)	$10.34	($41.52)	($38.36)	($44.65)	($1.97)	($48.50)	($45.34)	($51.62)	($18.05)
1999	($29.00)	($25.28)	($32.75)	$11.39	($20.21)	($16.49)	($23.96)	$10.72	($42.43)	($38.72)	($46.18)	($2.05)	($49.67)	($45.96)	($53.42)	($18.74)
2000	($29.44)	($25.09)	($33.83)	$11.81	($20.31)	($15.96)	($24.71)	$11.12	($43.38)	($39.03)	($47.78)	($2.13)	($50.90)	($46.55)	($55.30)	($19.46)
2001	($29.83)	($24.76)	($34.96)	$12.25	($20.36)	($15.29)	($25.48)	$11.54	($44.30)	($39.24)	($49.43)	($2.22)	($52.10)	($47.04)	($57.23)	($20.21)
2002	($30.17)	($24.27)	($36.15)	$12.71	($20.34)	($14.44)	($26.32)	$11.97	($45.20)	($39.30)	($51.18)	($2.31)	($53.30)	($47.40)	($59.28)	($20.98)
2003	($30.55)	($23.75)	($37.43)	$13.19	($20.34)	($13.55)	($27.22)	$12.42	($46.15)	($39.35)	($53.02)	($2.41)	($54.55)	($47.75)	($61.43)	($21.79)
2004	($31.10)	($23.22)	($38.85)	$13.68	($20.51)	($12.62)	($28.26)	$12.88	($47.29)	($39.40)	($55.04)	($2.51)	($56.02)	($48.13)	($63.77)	($22.62)
2005	($31.34)	($22.16)	($40.10)	$14.19	($20.34)	($11.17)	($29.10)	$13.36	($48.14)	($38.97)	($56.90)	($2.61)	($57.20)	($48.02)	($65.96)	($23.49)
2006	($31.62)	($21.03)	($41.47)	$14.72	($20.21)	($9.61)	($30.06)	$13.86	($49.06)	($38.47)	($58.92)	($2.72)	($58.47)	($47.87)	($68.32)	($24.39)
2007	($31.81)	($19.60)	($42.87)	$15.27	($19.96)	($7.75)	($31.03)	$14.38	($49.92)	($37.70)	($60.98)	($2.83)	($59.67)	($47.46)	($70.74)	($25.33)
2008	($31.42)	($17.24)	($43.94)	$15.84	($19.12)	($4.94)	($31.65)	$14.92	($50.21)	($36.04)	($62.74)	($2.95)	($60.34)	($46.16)	($72.87)	($26.30)
2009	($30.94)	($14.63)	($44.82)	$16.44	($18.18)	($1.86)	($32.06)	$15.47	($50.45)	($34.13)	($64.33)	($3.07)	($60.96)	($44.65)	($74.85)	($27.31)
2010	($30.25)	($11.48)	($45.63)	$17.05	($17.00)	$1.77	($32.38)	$16.05	($50.50)	($31.73)	($65.88)	($3.20)	($61.41)	($42.64)	($76.79)	($28.36)
2011	($29.41)	($7.88)	($46.44)	$17.69	($15.66)	$5.88	($32.68)	$16.65	($50.43)	($28.89)	($67.45)	($3.33)	($61.76)	($40.22)	($78.78)	($29.45)
2012	($28.44)	($3.79)	($47.25)	$18.35	($14.16)	$10.49	($32.98)	$17.27	($50.26)	($25.61)	($69.07)	($3.47)	($62.02)	($37.37)	($80.83)	($30.58)

IDR - Identified Deferrable Resource (BRPU/ER92)

Plant costs based on CEC TCR (ER92) & ETSR (ER90), SMUD ACS (7/92)

Natural Gas Prices: ER92 w/Delphi VI variance

Source: Foster Associates, Inc.

A leading factor making biomass plants uneconomic is the high construction cost per kilowatt of biomass-based capacity. Unfortunately, construction costs probably cannot be lowered significantly due to the nexus of size restrictions from fuel acquisition costs and related economies of scale. Since transportation costs are significant, these facilities typically cannot be any bigger than 50 MW in servicing a feasible territory because transport costs increase faster than the decreasing costs associated with a larger scale plant. If we assumed that existing coal-fired plants represent the technological end-point for boiler-driven generators, with a scale economy factor of 0.95, current biomass construction costs are near their minimum level for a 50 MW plant.

Net emission improvements from biomass generation also should be examined somewhat closely. For example, a U.C. Davis study estimated that the amount of petroleum input per biomass output ranged from 20 to 25 Btus per 100 Btus of output.[12] If one assumes that most of the fuel use is for diesel engines and boiler emissions are controlled to a 90 percent reduction level, NO_x emissions decrease 37 to 62 percent for straw and 17 to 42 percent for orchard prunings that are diverted to biomass-fueled facilities.[13] These calculations are important in determining the air quality offset values applicable to biomass utilization facilities.

A.5 The Ethanol Market

As an alcohol fuel, ethanol producers and blenders are eligible for several different federal tax benefits.[14] In addition, several corn-producing Midwestern states make additional tax credits to ethanol producers, but California does not offer any such subsidies. In general, ethanol producers may claim an income tax credit of 54 cents per gallon. The 1992 National Energy Policy Act (NEPA) granted an additional 10 cents per gallon income tax credit to facilities producing less than 30 million gallons per year. In alternative, fuel blenders may claim a sliding-scale excise tax exemption that begins at 5.4 cents per gallon for 10 percent-blend gasohol.[15] The latter option is the most commonly exercised since ethanol producers must have sufficient profits to claim the tax credits while the excise tax exemption is applied directly to the wholesale price by the fuel blenders. These tax subsidies are set to expire in 2001, but historically have been renewed by Congress on a regular basis.

---

[12]B.M. Jenkins and G. Knutson, *Energy Balances in Biomass Handling Systems: Net Energy Analysis of Electricity from Straw*, for presentation at the 1984 Winter Meetings American Society of Agricultural Engineers, Paper No. 84-3593, New Orleans, LA, December 1984.

[13]Diesel: South Coast Air Quality Management District Emission Schedule, 1990; Agricultural Residue: SEPCO Project 92-AFC-2, Data Adequacy Response, October 19, 1992, Response 6d.

[14]Federal Energy Subsidies, Energy Information Administration, November 1992, pp. 30, 115-116.

[15]*National Energy Policy Act of 1992*, H.R. 776, Section 1920, amending the 1986 Tax Reform Act, Section 4081, Congressional Record - House, October 5, 1992. p.H12124.

The current ethanol market price in California is about $1.25 per gallon.[16] In comparison, the wholesale cost in California for unleaded gasoline has been $0.55 to $0.70 per gallon,[17] with current prices at $0.58 per gallon or about $0.67 per gallon less than ethanol.[18] After accounting for federal and state subsidies, wholesale ethanol prices are about equivalent to those for wholesale gasoline, historically falling between the regular and premium grades.[19]

The future market for ethanol depends on several factors. First, the U.S. Environmental Protection Agency is considering whether to relax the volatility standards for reformulated gasoline (RFG) to allow gasohol use after 1995.[20] Current RFG rules would severely limit the ethanol market. On the other hand, the increased demand for oxygenate components in RFG could increase demand. Currently, methyl tertiary butyl ether (MTBE) is the most common additive, but an additive made from ethanol, ethyl tertiary butyl ether (ETBE) may be an adequate or superior substitute. MTBE is made from methanol and two trends may create an MTBE shortage. In the short run, MTBE production capacity may not be able to meet RFG demand in 1996.[21] In the mid-term, increasing demand for methanol by alternative-fueled vehicles may divert production away from MTBE. This is particularly true in California with the CARB low-emission vehicle regulations. Methanol production shortage has been an ongoing concern in the South Coast Air Quality Management District's own methanol-promotion program. In addition, the ethanol used in ETBE is now eligible for the income tax credit.[22] An added advantage of ETBE is that it is less volatile than MTBE, with a Reed Vapor Pressure (RVP) of 4 psi versus 8 psi for MTBE, making it easier for refiners to meet RFG standards.[23]

A.6 Ethanol from Corn and Other Sources

Most of the nation's ethanol is produced from corn grown in the Midwestern U.S., at a production rate of about 2.5 gallons per bushel for the "wet mill" process, and slightly less for the "dry mill" method. A USDA study found that the expected investment costs for a new plant would be $2.00 to $2.50 per gallon installed capacity; a state-of-the-art plant could operate at about 38 cents per gallon,

---

[16]Rick Eastman, Parallel Products, communication July 1993.

[17]California Energy Commission, *Historical Petroleum Statistics*, 1991 Fuels Report Working Papers, P300-91-018WP3, Sacramento, California, December 1991.

[18]"U.S. Market Fuel Ethanol," New Fuels Report, July 12, 1993, p.16.

[19]Fuel Reformulation, April 1992.

[20]California Oxygenate Outlook, California Energy Commission, P300-93-002, March 1993. p.13.

[21]Ibid, p.42.

[22]Ibid, p.14.

[23]Ibid, p.38.

excluding corn fuel costs.[24] A survey of eleven existing plants found that the non-corn fuel operational costs averaged 47.2 cents per gallon for plants larger than 30 million gallons, and 50.5 cents per gallon for smaller plants. The average production efficiency was 2.5 gallons of ethanol per bushel, or about 89 gallons per ton of corn. Corn fuel costs vary substantially with the market price for the grain and the byproducts of the ethanol production process. Sale of byproducts have covered between 44 and 80 percent of corn costs. The net corn costs can range from 13 cents to 79 cent per gallon. For a state-of-the-art corn-fueled ethanol plant in the Midwest, total production costs run from $0.89 to $1.55 per gallon, with the average around $1.22 per gallon before the federal subsidy.

Another proposal has been to produce ethanol from pulp sludge.[25] A proposed $20 million plant would produce 10 million gallons annually at a cost cheaper than corn due to the low fuel costs.

A.7 SEPCO Ethanol Plant

The expected construction cost for the SEPCO ethanol-production facility is $61 to $68 million, with an additional $125 million to be spent by the SMUD Financing Authority for gas-fired combined-cycle electricity generation plant.[26] The installed capacity cost per gallon for the ethanol plant is $4.76 to $5.31 per gallon. The project developer, ARKENOL, Inc. projects gross operating costs of $1.47 per gallon, and total net ethanol costs of $0.99 to $1.30 per gallon depending on the financing source.[27] The developer envisions that the project will incur all costs for collecting the straw from the farmers' fields, and have begun signing intent agreements with growers.

Table A-12 shows a detailed analysis of the net production costs for ethanol at SEPCO, in the first three columns. The annual capacity is based on a production of 35,000 gallons per day, 324 days per year, amounting to 11.3 million gallons per year. The first column shows the project financing 80 percent of its costs through the California Pollution Control Financing Authority (PCFA). This type of financing leads to tax savings and lower cost of capital. The total cost for ethanol is $1.88 per gallon in this case. The second column compares the cost for a privately financed project with 70 percent debt and 30 percent equity. The total cost is $2.24 per gallon. This is the alternative if SEPCO is unable to gain PCFA financing. The third column shows a combined cogeneration-ethanol facility with private financing. This is more likely for a project that uses the SEPCO parameters and sells power to PG&E. Total ethanol cost is $2.83 per gallon in this case.

---

[24]Kane and Reilly, March 1989, op.cit

[25]"Turning Paper-mill Sludge into Clean-Burning Fuel," Business Week, October 19, 1992, p. 16.

[26]SEPCO Project Application for Certification. Submitted to the California Energy Commission, Sacramento Power, Inc. and Sacramento Ethanol Partners, August 1992, Section 7.1: and ARKENOL, Inc. *SEPCO Project, Cellulose to Ethanol Process Input to Foster Associates, Inc. Study "Economic Impacts of Alternatives to Crop Residue Burning,* October 5, 1993.

[27]ARKENOL Comments op. cit.

TABLE A-12 ETHANOL PRODUCTION COSTS - Lignocellulose Feedstock

Plant Type	Acid Hydrolysis					Enzymatic Hydrolysis		
Engineering	*SEPCO*	*SEPCO*	*=SEPCO w/Cogen*	*Stone & Webster*	*Badger*	*Stone & Webster*	*Chem.Sys.*	*UC FPL*
Financing	*[PCFA]*	*[Private]*	*[Private]*	*[Private]*	*[Private]*	*[Private]*	*[Private]*	*[Private]*
Location	California	California	California	Hawaii	Midwest	Hawaii	Michigan	California
Fuel Type	Rice Straw	Rice Straw	Rice Straw	Eucalyptus	Hardwood	Eucalyptus	Hardwood	Softwood
Capacity (MM gal/yr)	11.3	11.3	11.3	15.0	25.0	15.0	25.0	5.7
Installed Cost ($MM)	$61.2	$68.0	$186.2	$122.2	$139.8	$150.6	$120.7	$31.4
Ann. Capital $/Gal.	$0.87	$1.23	$2.92	$1.67	$1.14	$2.05	$0.99	$1.13
Production Cost ($MM)	$20.54	$20.54	$42.66	$29.04	$45.21	$32.15	$55.80	$11.88
$ per gallon	$1.81	$1.81	$3.76	$1.94	$1.81	$2.14	$2.23	$2.09
Raw Materials	$11.91	$11.91	$11.91	$16.12	$28.57	$10.46	$35.95	$4.75
Feedstock ($/BDT)	$36.16	$36.16	$36.16	$40.00	$40.00	$40.00	$40.00	$40.00
Feedstock (Tons/Yr)	132,241	132,241	132,241	316,700	590,400	231,746	836,027	118,800
Gasoline ($/Gal)	$0.71	$0.71	$0.71	$0.71	$0.71	$0.71		
Gasoline (Gal/Yr)	597,063	597,063	597,063	714,304	1,310,000	714,304		
Sulfuric Acid ($/Ton)	$90	$90	$90	$90	$90	$90	$90	
Sulfuric Acid (Tons/Yr)	12,895	12,895	12,895	19,250	18,155	7,635	27,897	
Quicklime ($/Ton)	$130	$130	$130	$130	$130			
Quicklime (Tons/Yr)	1,222	1,222	1,222	9,350	18,383			
NaOH ($/Ton)	$300	$300	$300			$570	$300	
NaOH (Tons/Yr)	10,940	10,940	10,940			5,772	3,093	
Chemicals ($MM)	$2.10	$2.10	$2.10	$1.87	$0.70	$2.16	$4.61	$3.00
O&M ($MM)	$0.94	$0.94	$3.00	$4.31	$9.54	$3.66	$11.34	$0.80
Labor ($MM) (1)	$2.94	$2.94	$2.94	$6.74	$6.40	$7.45	$2.60	$1.80
Energy ($MM)	$2.65	$2.65	$22.7			$8.41	$1.29	$1.53
Total Non-Ethanol Sale	$9.1	$9.1	$43.7	$12.0	$34.3	$0.0	$12.5	$0.4
$ per gallon	$0.80	$0.80	$3.85	$0.80	$1.37	$0.00	$0.50	$0.08
Electricity Sales (GWh)	0	0	1,030	8.6	176.0			
Price	$0.034	$0.034	$0.034	$0.047	$0.047			
Revenue ($MM)	$0.0	$0.0	$34.6	$0.4	$8.3			
Furfural/NaSiO (Tons)	72,480	72,480	72,480	29,000	65,100		18,250	40.5
Price	$130	$130	$130	$400	$400		$400	$57.00
Revenue ($MM)	$6.5	$6.5	$6.5	$11.6	$26.0		$7.3	
CO2 Sales (Tons)	35,886	35,886	35,886				81,416	17,907
Price	$20	$20	$20				$64	$6.23
Revenue ($MM)	$0.7	$0.7	$0.7				$5.2	$0.1
Residues Sales (2)	29,576	29,576	29,576					653
Price	$57	$57	$57					$500
Revenue ($MM)	$1.4	$1.4	$1.4					$0.3
Gypsum Sales (Tons)	24,050	24,050	24,050					
Price (Calcined)	$18	$18	$18					
Revenue ($MM)	$0.4	$0.4	$0.4					
Cost/Gal (1989$)								
Net Prod. $/Gal.	$1.009	$1.009	($0.090)	$1.136	$0.436	$2.143	$1.732	$2.011
Total $/Gal	$1.884	$2.235	$2.826	$2.801	$1.579	$4.196	$2.719	$3.139

(1) - Labor costs updated t o Calif. petroleum refinery wages.Includes overhead ratio of 2.0 [Stone & Webster & Chem Systems].
(2) - Sales of Yeast [UC FP L], or Lignin @ 11,400 Btu/# [SEPCO].
Sources: SERI/NREL Studies (1987), UC FPL (1992), SEPCO AFC (1992)

Source: Foster Associates, Inc.

The difference in the costs between the municipally and privately financed facilities is reflected in the annual capital cost per gallon -- $0.87 versus $1.23 per gallon.[28] The direct production costs, including natural gas costs of $2.70 per gallon, are $1.81 per gallon. The feedstock cost is derived from the straw collection and transportation section of this study and adjusted to bone-dry tons (BDT). The input chemical prices and amounts are from ARKENOL. The operation and maintenance (O&M) cost comes from a SEPCO data response.[29] Labor costs are ethanol plant employment (36 positions) working 330 days per year at wages equal to average California refinery wages, and loaded to account for taxes and benefits.[30] Natural gas costs are based on $2.70 per MMBtu.

The sale of byproducts has a large effect on the economic attractiveness of the project. Potentially valuable byproducts from the SEPCO ethanol plant include sodium silicate (72,480 tons per year), agricultural gypsum (24,050 tons), lignin biomass fuel (29,576 tons) and liquid CO_2 (35,886 tons). Prices were derived from dealer surveys. Sodium silicate is used to produce Zeolite, a substitute for phosphate in detergents. The national sodium silicate production capacity is about 1.3 million tons annually, with approximately 970,000 tons currently consumed annually.[31] The price paid for sodium silicate depends on several quality factors. The description of the material in the SEPCO AFC most closely follows those for Grade 40^2 or Grade N^3, both of which fetch a price of $8.25 per cwt FOB, or about $165 per ton. The highest grade -- Grade 52 -- can command a price of approximately $12.15 per cwt. The byproducts provide revenues of $0.80 per gallon of ethanol based on an annual output of 11.3 million gallons.[32]

Overall, ethanol production from the SEPCO plant is estimated to cost from $1.88 to $2.83 per gallon, depending on the assumed rates and sources for debt and equity and after deducting revenues from the sale of additional byproducts. The estimates provided by ARKENOL show substantially lower costs of $0.99 to $1.30 per gallon. While the ARKENOL analysis appears to be equally plausible, highlighting the key differences in assumptions is useful in understanding the disparities in the two analyses. Four assumptions lead to the majority of the difference:

---

[28]Annualized capital costs are based on a 30-year book life and calculated using CEC financial assumptions for biomass QF plants, adjusted for current economic conditions. (CEC, Energy Technology Status Report, Appendix A, Vol. I, P. 8-24.) The municipal bond rate is based on the latest SMUD bond issuance at 6.25 percent.

[29]SEPCO Project, 92-AFC-2, "First Set of Data Responses," 1992, AIR-29.

[30]The formula is: (36 workers)* 8 hours * 330 days * $15.47/hr * 2.0 labor multiplier. The number of employees was found in Tables 3.5.12.2 and 3.4.7; the average refinery wage rate came from the California Statistical Abstract - 1988, California Department of Finance, 1989 Table C-9. The labor multiplier is derived from the ethanol cost estimated done by Stone and Webster and Chem Systems for the Solar Energy Research Institute. (See note #36).

[31]Roy Chastain, Occidental Chemical, personal communication, February 16, 1993.

[32]The range of uncertainty around these estimates is discussed in Chapter 3.

(1) The analysis in this report assesses the SEPCO project from the perspective of an investor choosing among different options. Thus, a "hurdle rate of return" of 25 percent is applied to the capital costs. This is the same perspective used in the CEC's *Technology Characterization Report*, and the studies done on ethanol plants for SERI. The ARKENOL study includes only the recovery of debt costs on 80 percent of the project. The difference between the total costs and total revenues represents the stream of income from the investment. This perspective is useful for determining what is the profit level before deciding if the investment is preferred over other possible opportunities. This difference represents about 60 cents per gallon.

(2) The plant output was adjusted downward from 12.8 million gallons to 11.3 million gallons to match the reduction in operating factor to 88.8 percent in this report. This change represents about 12 cents per gallon.

(3) The feedstock collection costs in this report are based on studies discussed above in this Appendix. ARKENOL attributes its lower cost estimates to "lower handling costs, access fees, and large scale operations."[33] This difference represents about 12 cents per gallon.

(4) The labor cost estimates include benefits and overhead in this report; ARKENOL shows only salaries. This difference is offset by lower O&M and energy costs in this report versus the ARKENOL analysis.

The net difference attributable to these issues is about 85 cents per gallon, or virtually the entire amount. In general, we have adopted ARKENOL's updated price and quantity information, thus leaving these issues to be resolved in the CEC's AFC process.

A.8 Comparison of Prototype Ethanol Plant Studies

Various studies have been conducted examining ethanol production costs.[34] These studies have resulted in a range of production cost estimates, depending on the process used and the economic assumptions upon which the studies are based. Estimates of ethanol production costs contained in these reports range from a low of $1.58 per gallon to a high of $4.20. For example, studies of two methods of distilling 5 to 25 million gallons per year of ethanol from wood feedstock resulted in cost estimates

---

[33]ARKENOL, Comments, op. cit. No. 15.

[34]John D. Wright, Tom Milne, Michael E. Karpuk, Steven Issacs, William Hoagland, *Summary Report: Economic Feasibility Studies of Alcohol Fuel Production Processes*, SERI/TR-232-2719, Prepared for U.S. Department of Energy, Golden, CO, September 1986; Stone and Webster Engineering Corp., *Economic Feasibility Study of an Acid-Based Ethanol Plant*, A Subcontractor Report, SERI/STR-231-3139, U.S. DOE, Golden, CO, April 1987; Badger Engineers, Inc., *Economic Feasibility Study of an Acid Hydrolysis-Based Ethanol Plant*, A Subcontractor Report, SERI/STR-231-3142, U.S. DOE, Golden, CO, April 1987; Chem Systems, Inc., *Economic Feasibility Study of an Enzymatic Hydrolysis-Based Ethanol Plant with Prehydrolysis Treatment*, A Subcontractor Report, SERI/STR-231-3135, U.S. DOE, Golden, CO, April 1987; Stone and Webster Engineering Co., *Economic Feasibility Study of an Enzyme-Based Ethanol Plant*, A Subcontractor Report, SERI/STR-231-3138, U.S. DOE, April 1987.

ranging from $1.71 to $3.78 per gallon (1984$). Another study estimated that the base cost for a 25 million gallon per year plant would be between $1.78 to $2.66 per gallon, with prices dropping to $1.35 a gallon if the reaction rate could be substantially increased.

Finally, a recent study by the University of California estimated ethanol production costs of $3.14 a gallon, with economies of scale potentially resulting in even lower costs. David Brink at the University of California's Forest Products Laboratory has been working on a ligno-cellulose enzymatic conversion process.[35] In a recent study, his team estimated costs for producing ethanol in California from softwoods (evergreens), hardwoods (deciduous), and paper waste. The proposed plant would produce 5.7 million gallons per year.

Table A-12 compares the costs for these studies to those for the SEPCO Project. The economic assumptions were standardized to the extent possible. In general, labor costs were updated to those representative of California petroleum refineries, inflation was set at 4 percent, expected nominal pre-tax return on investment was assumed to be 25 percent, debt interest was set at 7.2 percent, plant life assumed to be 30 years, and chemical, feedstock and fuel prices were equalized across plants. Utility rates differ and capital costs were unchanged from the original analyses, even though some of these studies were done based on 1984 prices. Byproduct prices were standardized across projects. For the SEPCO plant, the price for lignin sold to biomass facilities was tied to the feedstock input price, and transportation costs were netted from sales revenues for sodium silicate, carbon dioxide and lignin. The financial assumptions differ for SEPCO as well because it is financed by municipal bonds through PCFA, thereby lowering capital costs. The costs range from $1.58 to $4.20 per gallon on these common assumptions.

Even with these large cost ranges, further uncertainty is engendered by potential variations in production efficiency and byproduct sale prices. The differences in the estimated costs are rooted in both assumptions about production processes and the costs of inputs such as capital, labor and chemicals. In general, the acid-based process appeared to have lower costs than the enzymatic-based method, probably due to the greater experience with the former technology; however, the enzymatic process is believed to hold more promise.

---

[35]David L. Brink and E.E. Gullekson, *Aspects of Economics of a Small Sized HFC Process Plant of Manufacture of Ethanol from Renewable Biomass*, University of California Forest Products Laboratory, August 7, 1992.

A.9 Sacramento Valley Landfill Data

A telephone survey was conducted of various rural landfills that might face increased agricultural residue wastestreams in the wake of a burning ban. The results are shown in Table A-13. In most cases, the tipping fees appear to be prohibitive to use by farmers for large-scale disposal.[36]

TABLE A-13

SACRAMENTO VALLEY LANDFILL RATES

COUNTY	Ownership	Refuse Type	Tipping Fee Per Unit	Daily Volume	Expected Closure	Daily Cover	
						Cubic Yds	Type
Butte	Public	Comm. uncomp.	$1.15/cu.yd	400 tons	2006	400	soil
		Comm. compact	$9/ton				
Colusa	Public		$29.50/ton	70 tons	2036	50	soil
Glenn	Public		$1.75/cu.yd	62 tons	2021		soil
Placer	Public		$20.00/ton		2023		
Sacramento	Public		$25.00/ton		2002/2050?		
Solano-Porter Hill	Private		$29.10/ton				
Solano-B&J	Private		$31.80/ton		2019		
Tehama	Public		$4.50/cu.yd	150-200 tons	Mid-1994	10K sqft	plastic
Yolo	Public	In county	$30.00/ton		2017		ag.compost
		Non county	$35.00/ton				
		Woodchipper	$45.00/ton				
Yuba/Sutter	Private		$23.00/ton	300-400 tons	1996-1999		soil
Yuba/Sutter	Public		$6.00/cu.yd	50-150 cu.yd		30	aggregate

Source: Telephone Survey, November 1992.

Material Density: Loose straw: 81 lbs/cu.yd

Baled straw: 270 lbs/cu.yd

Wood chips: 270 lbs/cu.yd

[36]Rates for cubic yards can be converted using approximate densities for loose straw of 81 pounds per cubic yard; for baled straw, 270 pounds for baled straw; and 270 pounds for wood chips. (J. Knutson and G. Miller, op.cit.)

Appendix B

Financial Spreadsheets

Burn Alternative #1: Chop Straw, Leave on Ground
Farming Operation Type #A
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67
CCC Marketing Loan Program Cash Offset	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00
Total Receipts per Acre							
With Field Burning	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
With Non-Burning Options	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Receipts per cwt							
With Field Burning	$10.45	$10.23	$10.07	$9.95	$9.86	$9.79	$9.73
With Non-Burning Options	$10.53	$10.30	$10.13	$10.00	$9.91	$9.83	$9.76
Costs With Field Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Prepare fields for burning	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44
Burn Permits and Fees	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34
Burn Acreage (@ 90%)	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Incorporate Straw (@ 10%)	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68
Operating Capital @ 9%; Investment @4%	$38.01	$38.75	$39.48	$40.22	$40.96	$41.69	$42.43
Total Operating Cost per Acre	$477.02	$491.06	$505.09	$519.13	$533.17	$547.20	$561.24
Total Operating Cost per cwt	$9.54	$8.18	$7.22	$6.49	$5.92	$5.47	$5.10
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$666.79	$680.83	$694.86	$708.90	$722.94	$736.97	$751.01
Total Cash Costs per cwt	$13.34	$11.35	$9.93	$8.86	$8.03	$7.37	$6.83
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$741.84	$755.88	$769.91	$783.95	$797.99	$812.02	$826.06
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Cost With Alternative to Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Incorporate Straw	$2.54	$2.54	$2.54	$2.54	$2.54	$2.54	$2.54
Remove Straw							
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$37.61	$38.35	$39.09	$39.82	$40.56	$41.30	$42.04
Total Operating Cost per Acre	$469.50	$483.54	$497.58	$511.61	$525.65	$539.69	$553.73
Total Operating Cost per cwt	$9.39	$8.06	$7.11	$6.40	$5.84	$5.40	$5.03
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$659.27	$673.31	$687.35	$701.38	$715.42	$729.46	$743.50
Total Cash Costs per cwt	$13.19	$11.22	$9.82	$8.77	$7.95	$7.29	$6.76
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$734.32	$748.36	$762.40	$776.43	$790.47	$804.51	$818.55
Total Costs per cwt	$14.69	$12.47	$10.89	$9.71	$8.78	$8.05	$7.44
Revenues/Costs with Field Burning							
Total Revenue per Acre	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
Total Cost per Acre	$741.84	$755.88	$769.91	$783.95	$797.99	$812.02	$826.06
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Net Revenue Per Acre	($219.17)	($142.01)	($64.85)	$12.32	$89.48	$166.64	$243.81
Revenues/Costs without Field Burning							
Total Revenue per Acre	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Costs per Acre	$734.32	$748.36	$762.40	$776.43	$790.47	$804.51	$818.55
Total Costs per cwt	$14.69	$12.47	$10.89	$9.71	$8.78	$8.05	$7.44
Net Revenue Per Acre	($207.66)	($130.49)	($53.33)	$23.83	$101.00	$178.16	$255.32
Net Benefits for Non-Burning Alternative							
Per Acre	$11.51	$11.51	$11.51	$11.51	$11.51	$11.51	$11.51
Per CWT	$0.23	$0.19	$0.16	$0.14	$0.13	$0.12	$0.10

Burn Alternative #1: Chop Straw, Leave on Ground
Farming Operation Type #B
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67
CCC Marketing Loan Program Cash Offset	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00
Total Receipts per Acre							
With Field Burning	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
With Non-Burning Options	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Receipts per cwt							
With Field Burning	$12.45	$11.90	$11.50	$11.20	$10.97	$10.79	$10.64
With Non-Burning Options	$12.65	$12.06	$11.64	$11.33	$11.08	$10.89	$10.73
Costs With Field Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Prepare fields for burning							
Burn Permits and Fees	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48
Burn Acreage (@ 70%)	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50
Incorporate Straw (@ 30%)	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10
Operating Capital @ 9%; Investment @4%	$30.53	$31.27	$32.01	$32.74	$33.48	$34.22	$34.95
Total Operating Cost per Acre	$419.06	$433.10	$447.14	$461.17	$475.21	$489.25	$503.28
Total Operating Cost per cwt	$8.38	$7.22	$6.39	$5.76	$5.28	$4.89	$4.58
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$473.90	$487.94	$501.98	$516.01	$530.05	$544.09	$558.12
Total Cash Costs per cwt	$9.48	$8.13	$7.17	$6.45	$5.89	$5.44	$5.07
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$615.19	$629.23	$643.27	$657.30	$671.34	$685.38	$699.41
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Cost With Alternative to Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Incorporate Straw	$2.54	$2.54	$2.54	$2.54	$2.54	$2.54	$2.54
Remove Straw							
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$30.28	$31.02	$31.75	$32.49	$33.23	$33.96	$34.70
Total Operating Cost per Acre	$414.27	$428.31	$442.34	$456.38	$470.42	$484.45	$498.49
Total Operating Cost per cwt	$8.29	$7.14	$6.32	$5.70	$5.23	$4.84	$4.53
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$469.11	$483.15	$497.18	$511.22	$525.26	$539.29	$553.33
Total Cash Costs per cwt	$9.38	$8.05	$7.10	$6.39	$5.84	$5.39	$5.03
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$610.40	$624.44	$638.47	$652.51	$666.55	$680.58	$694.62
Total Costs per cwt	$12.21	$10.41	$9.12	$8.16	$7.41	$6.81	$6.31
Revenues/Costs with Field Burning							
Total Revenue per Acre	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
Total Cost per Acre	$615.19	$629.23	$643.27	$657.30	$671.34	$685.38	$699.41
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Net Revenue Per Acre	$7.48	$84.64	$161.80	$238.96	$316.13	$393.29	$470.45
Revenues/Costs without Field Burning							
Total Revenue per Acre	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Costs per Acre	$610.40	$624.44	$638.47	$652.51	$666.55	$680.58	$694.62
Total Costs per cwt	$12.21	$10.41	$9.12	$8.16	$7.41	$6.81	$6.31
Net Revenue Per Acre	$22.27	$99.43	$176.59	$253.76	$330.92	$408.08	$485.25
Net Benefits for Non-Burning Alternative							
Per Acre	$14.79	$14.79	$14.79	$14.79	$14.79	$14.79	$14.79
Per CWT	$0.30	$0.25	$0.21	$0.18	$0.16	$0.15	$0.13

Burn Alternative #1: Chop Straw, Leave on Ground
Farming Operation Type #C
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11
CCC Marketing Loan Program Cash Offset	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67
Total Receipts per Acre							
With Field Burning	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
With Non-Burning Options	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Receipts per cwt							
With Field Burning	$11.34	$10.97	$10.71	$10.51	$10.35	$10.23	$10.13
With Non-Burning Options	$11.48	$11.08	$10.80	$10.59	$10.43	$10.30	$10.19
Costs With Field Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	$80.39
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$58.30
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Prepare fields for burning	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Permits and Fees	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Acreage	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91
Total Operating Cost per Acre	$344.01	$356.62	$369.23	$381.83	$394.44	$407.05	$419.66
Total Operating Cost per cwt	$6.88	$5.94	$5.27	$4.77	$4.38	$4.07	$3.82
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$555.48	$568.09	$580.70	$593.30	$605.91	$618.52	$631.13
Total Cash Costs per cwt	$11.11	$9.47	$8.30	$7.42	$6.73	$6.19	$5.74
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%; Investment @4%	$32.88	$33.54	$34.20	$34.86	$35.53	$36.19	$36.85
Total Cost per acre	$681.23	$694.50	$707.77	$721.04	$734.31	$747.58	$760.85
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Cost With Alternative to Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	$80.39
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$58.30
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Incorporate Straw	$2.54	$2.54	$2.54	$2.54	$2.54	$2.54	$2.54
Remove Straw							
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Operating Cost per Acre	$343.64	$356.25	$368.86	$381.46	$394.07	$406.68	$419.29
Total Operating Cost per cwt	$6.87	$5.94	$5.27	$4.77	$4.38	$4.07	$3.81
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$555.11	$567.72	$580.33	$592.93	$605.54	$618.15	$630.76
Total Cash Costs per cwt	$11.10	$9.46	$8.29	$7.41	$6.73	$6.18	$5.73
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%; Investment @4%	$32.86	$33.52	$34.18	$34.84	$35.51	$36.17	$36.83
Total Cost per acre	$680.84	$694.11	$707.38	$720.65	$733.92	$747.19	$760.46
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.15	$7.47	$6.91
Revenues/Costs with Field Burning							
Total Revenue per Acre	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
Total Cost per Acre	$681.23	$694.50	$707.77	$721.04	$734.31	$747.58	$760.85
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Net Revenue Per Acre	($114.12)	($36.19)	$41.74	$119.67	$197.60	$275.53	$353.46
Revenues/Costs without Field Burning							
Total Revenue per Acre	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Costs per Acre	$680.84	$694.11	$707.38	$720.65	$733.92	$747.19	$760.46
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.15	$7.47	$6.91
Net Revenue Per Acre	($107.06)	($29.13)	$48.80	$126.73	$204.66	$282.59	$360.52
Net Benefits for Non-Burning Alternative							
Per Acre	$7.06	$7.06	$7.06	$7.06	$7.06	$7.06	$7.06
Per CWT	$0.14	$0.12	$0.10	$0.09	$0.08	$0.07	$0.06

Burn Alternative #2: Chop Straw, Disc Once
Farming Operation Type #A
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67
CCC Marketing Loan Program Cash Offset	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00
Total Receipts per Acre							
With Field Burning	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
With Non-Burning Options	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Receipts per cwt							
With Field Burning	$10.45	$10.23	$10.07	$9.95	$9.86	$9.79	$9.73
With Non-Burning Options	$10.53	$10.30	$10.13	$10.00	$9.91	$9.83	$9.76
Costs With Field Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Prepare fields for burning	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44
Burn Permits and Fees	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34
Burn Acreage (@ 90%)	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Incorporate Straw (@ 10%)	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68
Operating Capital @ 9%; Investment @4%	$38.01	$38.75	$39.48	$40.22	$40.96	$41.69	$42.43
Total Operating Cost per Acre	$477.02	$491.06	$505.09	$519.13	$533.17	$547.20	$561.24
Total Operating Cost per cwt	$9.54	$8.18	$7.22	$6.49	$5.92	$5.47	$5.10
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$666.79	$680.83	$694.86	$708.90	$722.94	$736.97	$751.01
Total Cash Costs per cwt	$13.34	$11.35	$9.93	$8.86	$8.03	$7.37	$6.83
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$741.84	$755.88	$769.91	$783.95	$797.99	$812.02	$826.06
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Cost With Alternative to Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Incorporate Straw	$9.59	$9.59	$9.59	$9.59	$9.59	$9.59	$9.59
Remove Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$38.00	$38.74	$39.48	$40.22	$40.95	$41.69	$42.43
Total Operating Cost per Acre	$476.94	$490.98	$505.02	$519.06	$533.09	$547.13	$561.17
Total Operating Cost per cwt	$9.54	$8.18	$7.21	$6.49	$5.92	$5.47	$5.10
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$666.71	$680.75	$694.79	$708.83	$722.86	$736.90	$750.94
Total Cash Costs per cwt	$13.33	$11.35	$9.93	$8.86	$8.03	$7.37	$6.83
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$741.76	$755.80	$769.84	$783.88	$797.91	$811.95	$825.99
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Revenues/Costs with Field Burning							
Total Revenue per Acre	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
Total Cost per Acre	$741.84	$755.88	$769.91	$783.95	$797.99	$812.02	$826.06
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Net Revenue Per Acre	($219.17)	($142.01)	($64.85)	$12.32	$89.48	$166.64	$243.81
Revenues/Costs without Field Burning							
Total Revenue per Acre	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Costs per Acre	$741.76	$755.80	$769.84	$783.88	$797.91	$811.95	$825.99
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Net Revenue Per Acre	($215.10)	($137.93)	($60.77)	$16.39	$93.55	$170.72	$247.88
Net Benefits for Non-Burning Alternative							
Per Acre	$4.07	$4.07	$4.07	$4.07	$4.07	$4.07	$4.07
Per CWT	$0.08	$0.07	$0.06	$0.05	$0.05	$0.04	$0.04

Burn Alternative #2: Chop Straw, Disc Once
Farming Operation Type #B
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67
CCC Marketing Loan Program Cash Offset	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00
Total Receipts per Acre							
With Field Burning	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
With Non-Burning Options	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Receipts per cwt							
With Field Burning	$12.45	$11.90	$11.50	$11.20	$10.97	$10.79	$10.64
With Non-Burning Options	$12.65	$12.06	$11.64	$11.33	$11.08	$10.89	$10.73
Costs With Field Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Prepare fields for burning							
Burn Permits and Fees	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48
Burn Acreage (@ 70%)	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50
Incorporate Straw (@ 30%)	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10
Operating Capital @ 9%; Investment @4%	$30.53	$31.27	$32.01	$32.74	$33.48	$34.22	$34.95
Total Operating Cost per Acre	$419.06	$433.10	$447.14	$461.17	$475.21	$489.25	$503.28
Total Operating Cost per cwt	$8.38	$7.22	$6.39	$5.76	$5.28	$4.89	$4.58
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$473.90	$487.94	$501.98	$516.01	$530.05	$544.09	$558.12
Total Cash Costs per cwt	$9.48	$8.13	$7.17	$6.45	$5.89	$5.44	$5.07
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$615.19	$629.23	$643.27	$657.30	$671.34	$685.38	$699.41
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Cost With Alternative to Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Incorporate Straw	$9.59	$9.59	$9.59	$9.59	$9.59	$9.59	$9.59
Remove Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$30.67	$31.41	$32.14	$32.88	$33.62	$34.36	$35.09
Total Operating Cost per Acre	$421.71	$435.75	$449.78	$463.82	$477.86	$491.90	$505.93
Total Operating Cost per cwt	$8.43	$7.26	$6.43	$5.80	$5.31	$4.92	$4.60
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$476.55	$490.59	$504.62	$518.66	$532.70	$546.74	$560.77
Total Cash Costs per cwt	$9.53	$8.18	$7.21	$6.48	$5.92	$5.47	$5.10
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$617.84	$631.88	$645.91	$659.95	$673.99	$688.03	$702.06
Total Costs per cwt	$12.36	$10.53	$9.23	$8.25	$7.49	$6.88	$6.38
Revenues/Costs with Field Burning							
Total Revenue per Acre	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
Total Cost per Acre	$615.19	$629.23	$643.27	$657.30	$671.34	$685.38	$699.41
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Net Revenue Per Acre	$7.48	$84.64	$161.80	$238.96	$316.13	$393.29	$470.45
Revenues/Costs without Field Burning							
Total Revenue per Acre	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Costs per Acre	$617.84	$631.88	$645.91	$659.95	$673.99	$688.03	$702.06
Total Costs per cwt	$12.36	$10.53	$9.23	$8.25	$7.49	$6.88	$6.38
Net Revenue Per Acre	$14.83	$91.99	$169.15	$246.32	$323.48	$400.64	$477.80
Net Benefits for Non-Burning Alternative							
Per Acre	$7.35	$7.35	$7.35	$7.35	$7.35	$7.35	$7.35
Per CWT	$0.15	$0.12	$0.11	$0.09	$0.08	$0.07	$0.07

Burn Alternative #2: Chop Straw, Disc Once
Farming Operation Type #C
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11
CCC Marketing Loan Program Cash Offset	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67
Total Receipts per Acre							
With Field Burning	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
With Non-Burning Options	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Receipts per cwt							
With Field Burning	$11.34	$10.97	$10.71	$10.51	$10.35	$10.23	$10.13
With Non-Burning Options	$11.48	$11.08	$10.80	$10.59	$10.43	$10.30	$10.19
Costs With Field Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	$80.39
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$58.30
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Prepare fields for burning	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Permits and Fees	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Acreage	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91
Total Operating Cost per Acre	$344.01	$356.62	$369.23	$381.83	$394.44	$407.05	$419.66
Total Operating Cost per cwt	$6.88	$5.94	$5.27	$4.77	$4.38	$4.07	$3.82
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$555.48	$568.09	$580.70	$593.30	$605.91	$618.52	$631.13
Total Cash Costs per cwt	$11.11	$9.47	$8.30	$7.42	$6.73	$6.19	$5.74
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%; Investment @4%	$32.88	$33.54	$34.20	$34.86	$35.53	$36.19	$36.85
Total Cost per acre	$681.23	$694.50	$707.77	$721.04	$734.31	$747.58	$760.85
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Cost With Alternative to Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	$80.39
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$58.30
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Incorporate Straw	$12.24	$12.24	$12.24	$12.24	$12.24	$12.24	$12.24
Remove Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Operating Cost per Acre	$353.34	$365.95	$378.56	$391.16	$403.77	$416.38	$428.99
Total Operating Cost per cwt	$7.07	$6.10	$5.41	$4.89	$4.49	$4.16	$3.90
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$564.81	$577.42	$590.03	$602.63	$615.24	$627.85	$640.46
Total Cash Costs per cwt	$11.30	$9.62	$8.43	$7.53	$6.84	$6.28	$5.82
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%; Investment @4%	$33.37	$34.03	$34.69	$35.35	$36.02	$36.68	$37.34
Total Cost per acre	$691.05	$704.32	$717.59	$730.86	$744.13	$757.40	$770.67
Total Costs per cwt	$13.82	$11.74	$10.25	$9.14	$8.27	$7.57	$7.01
Revenues/Costs with Field Burning							
Total Revenue per Acre	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
Total Cost per Acre	$681.23	$694.50	$707.77	$721.04	$734.31	$747.58	$760.85
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Net Revenue Per Acre	($114.12)	($36.19)	$41.74	$119.67	$197.60	$275.53	$353.46
Revenues/Costs without Field Burning							
Total Revenue per Acre	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Costs per Acre	$691.05	$704.32	$717.59	$730.86	$744.13	$757.40	$770.67
Total Costs per cwt	$13.82	$11.74	$10.25	$9.14	$8.27	$7.57	$7.01
Net Revenue Per Acre	($117.27)	($39.34)	$38.59	$116.52	$194.45	$272.38	$350.31
Net Benefits for Non-Burning Alternative							
Per Acre	($3.15)	($3.15)	($3.15)	($3.15)	($3.15)	($3.15)	($3.15)
Per CWT	($0.06)	($0.05)	($0.05)	($0.04)	($0.04)	($0.03)	($0.03)

Burn Alternative #3: Chop Straw, Disc and Plow Once
Farming Operation Type #A
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67
CCC Marketing Loan Program Cash Offset	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00
Total Receipts per Acre							
With Field Burning	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
With Non-Burning Options	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Receipts per cwt							
With Field Burning	$10.45	$10.23	$10.07	$9.95	$9.86	$9.79	$9.73
With Non-Burning Options	$10.53	$10.30	$10.13	$10.00	$9.91	$9.83	$9.76
Costs With Field Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Prepare fields for burning	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44
Burn Permits and Fees	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34
Burn Acreage (@ 90%)	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Incorporate Straw (@ 10%)	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68
Operating Capital @ 9%; Investment @4%	$38.01	$38.75	$39.48	$40.22	$40.96	$41.69	$42.43
Total Operating Cost per Acre	$477.02	$491.06	$505.09	$519.13	$533.17	$547.20	$561.24
Total Operating Cost per cwt	$9.54	$8.18	$7.22	$6.49	$5.92	$5.47	$5.10
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$666.79	$680.83	$694.86	$708.90	$722.94	$736.97	$751.01
Total Cash Costs per cwt	$13.34	$11.35	$9.93	$8.86	$8.03	$7.37	$6.83
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$741.84	$755.88	$769.91	$783.95	$797.99	$812.02	$826.06
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Cost With Alternative to Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Incorporate Straw	$20.28	$20.28	$20.28	$20.28	$20.28	$20.28	$20.28
Remove Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$38.60	$39.33	$40.07	$40.81	$41.54	$42.28	$43.02
Total Operating Cost per Acre	$488.23	$502.26	$516.30	$530.34	$544.37	$558.41	$572.45
Total Operating Cost per cwt	$9.76	$8.37	$7.38	$6.63	$6.05	$5.58	$5.20
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$678.00	$692.03	$706.07	$720.11	$734.14	$748.18	$762.22
Total Cash Costs per cwt	$13.56	$11.53	$10.09	$9.00	$8.16	$7.48	$6.93
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$753.05	$767.08	$781.12	$795.16	$809.19	$823.23	$837.27
Total Costs per cwt	$15.06	$12.78	$11.16	$9.94	$8.99	$8.23	$7.61
Revenues/Costs with Field Burning							
Total Revenue per Acre	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
Total Cost per Acre	$741.84	$755.88	$769.91	$783.95	$797.99	$812.02	$826.06
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Net Revenue Per Acre	($219.17)	($142.01)	($64.85)	$12.32	$89.48	$166.64	$243.81
Revenues/Costs without Field Burning							
Total Revenue per Acre	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Costs per Acre	$753.05	$767.08	$781.12	$795.16	$809.19	$823.23	$837.27
Total Costs per cwt	$15.06	$12.78	$11.16	$9.94	$8.99	$8.23	$7.61
Net Revenue Per Acre	($226.38)	($149.22)	($72.05)	$5.11	$82.27	$159.44	$236.60
Net Benefits for Non Burning Alternative							
Per Acre	($7.21)	($7.21)	($7.21)	($7.21)	($7.21)	($7.21)	($7.21)
Per CWT	($0.22)	($0.19)	($0.16)	($0.14)	($0.12)	($0.11)	($0.10)

Burn Alternative #3: Chop Straw, Disc and Plow Once
Farming Operation Type #B
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67
CCC Marketing Loan Program Cash Offset	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00
Total Receipts per Acre							
With Field Burning	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
With Non-Burning Options	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Receipts per cwt							
With Field Burning	$12.45	$11.90	$11.50	$11.20	$10.97	$10.79	$10.64
With Non-Burning Options	$12.65	$12.06	$11.64	$11.33	$11.08	$10.89	$10.73
Costs With Field Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Prepare fields for burning							
Burn Permits and Fees	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48
Burn Acreage (@ 70%)	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50
Incorporate Straw (@ 30%)	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10
Operating Capital @ 9%; Investment @4%	$30.53	$31.27	$32.01	$32.74	$33.48	$34.22	$34.95
Total Operating Cost per Acre	$419.06	$433.10	$447.14	$461.17	$475.21	$489.25	$503.28
Total Operating Cost per cwt	$8.38	$7.22	$6.39	$5.76	$5.28	$4.89	$4.58
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$473.90	$487.94	$501.98	$516.01	$530.05	$544.09	$558.12
Total Cash Costs per cwt	$9.48	$8.13	$7.17	$6.45	$5.89	$5.44	$5.07
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$615.19	$629.23	$643.27	$657.30	$671.34	$685.38	$699.41
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Cost With Alternative to Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Incorporate Straw	$20.28	$20.28	$20.28	$20.28	$20.28	$20.28	$20.28
Remove Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$31.26	$32.00	$32.74	$33.47	$34.21	$34.95	$35.68
Total Operating Cost per Acre	$432.99	$447.03	$461.07	$475.10	$489.14	$503.18	$517.21
Total Operating Cost per cwt	$8.66	$7.45	$6.59	$5.94	$5.43	$5.03	$4.70
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$487.83	$501.87	$515.91	$529.94	$543.98	$558.02	$572.05
Total Cash Costs per cwt	$9.76	$8.36	$7.37	$6.62	$6.04	$5.58	$5.20
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$629.12	$643.16	$657.20	$671.23	$685.27	$699.31	$713.34
Total Costs per cwt	$12.58	$10.72	$9.39	$8.39	$7.61	$6.99	$6.48
Revenues/Costs with Field Burning							
Total Revenue per Acre	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
Total Cost per Acre	$615.19	$629.23	$643.27	$657.30	$671.34	$685.38	$699.41
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Net Revenue Per Acre	$7.48	$84.64	$161.80	$238.96	$316.13	$393.29	$470.45
Revenues/Costs without Field Burning							
Total Revenue per Acre	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Costs per Acre	$629.12	$643.16	$657.20	$671.23	$685.27	$699.31	$713.34
Total Costs per cwt	$12.58	$10.72	$9.39	$8.39	$7.61	$6.99	$6.48
Net Revenue Per Acre	$3.54	$80.71	$157.87	$235.03	$312.20	$389.36	$466.52
Net Benefits for Non Burning Alternative							
Per Acre	($3.93)	($3.93)	($3.93)	($3.93)	($3.93)	($3.93)	($3.93)
Per CWT	($0.28)	($0.23)	($0.20)	($0.17)	($0.15)	($0.14)	($0.13)

Burn Alternative #3: Chop Straw, Disc and Plow Once
Farming Operation Type #C
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11
CCC Marketing Loan Program Cash Offset	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67
Total Receipts per Acre							
With Field Burning	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
With Non-Burning Options	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Receipts per cwt							
With Field Burning	$11.34	$10.97	$10.71	$10.51	$10.35	$10.23	$10.13
With Non-Burning Options	$11.48	$11.08	$10.80	$10.59	$10.43	$10.30	$10.19
Costs With Field Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	$80.39
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$58.30
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Prepare fields for burning	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Permits and Fees	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Acreage	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91
Total Operating Cost per Acre	$344.01	$356.62	$369.23	$381.83	$394.44	$407.05	$419.66
Total Operating Cost per cwt	$6.88	$5.94	$5.27	$4.77	$4.38	$4.07	$3.82
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$555.48	$568.09	$580.70	$593.30	$605.91	$618.52	$631.13
Total Cash Costs per cwt	$11.11	$9.47	$8.30	$7.42	$6.73	$6.19	$5.74
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%; Investment @4%	$32.88	$33.54	$34.20	$34.86	$35.53	$36.19	$36.85
Total Cost per acre	$681.23	$694.50	$707.77	$721.04	$734.31	$747.58	$760.85
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Cost With Alternative to Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	$80.39
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$58.30
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Incorporate Straw	$22.93	$22.93	$22.93	$22.93	$22.93	$22.93	$22.93
Remove Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Operating Cost per Acre	$364.03	$376.64	$389.25	$401.85	$414.46	$427.07	$439.68
Total Operating Cost per cwt	$7.28	$6.28	$5.56	$5.02	$4.61	$4.27	$4.00
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$575.50	$588.11	$600.72	$613.32	$625.93	$638.54	$651.15
Total Cash Costs per cwt	$11.51	$9.80	$8.58	$7.67	$6.95	$6.39	$5.92
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%; Investment @4%	$33.93	$34.59	$35.25	$35.91	$36.58	$37.24	$37.90
Total Cost per acre	$702.30	$715.57	$728.84	$742.11	$755.38	$768.65	$781.92
Total Costs per cwt	$14.05	$11.93	$10.41	$9.28	$8.39	$7.69	$7.11
Revenues/Costs with Field Burning							
Total Revenue per Acre	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
Total Cost per Acre	$681.23	$694.50	$707.77	$721.04	$734.31	$747.58	$760.85
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Net Revenue Per Acre	($114.12)	($36.19)	$41.74	$119.67	$197.60	$275.53	$353.46
Revenues/Costs without Field Burning							
Total Revenue per Acre	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Costs per Acre	$702.30	$715.57	$728.84	$742.11	$755.38	$768.65	$781.92
Total Costs per cwt	$14.05	$11.93	$10.41	$9.28	$8.39	$7.69	$7.11
Net Revenue Per Acre	($128.52)	($50.59)	$27.34	$105.27	$183.20	$261.13	$339.06
Net Benefits for Non Burning Alternative							
Per Acre	($14.40)	($14.40)	($14.40)	($14.40)	($14.40)	($14.40)	($14.40)
Per CWT	($0.42)	($0.35)	($0.30)	($0.26)	($0.23)	($0.21)	($0.19)

Burn Alternative #4: Chop Straw, Till Field Once
Farming Operation Type #A
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67
CCC Marketing Loan Program Cash Offset	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00
Total Receipts per Acre							
With Field Burning	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
With Non-Burning Options	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Receipts per cwt							
With Field Burning	$10.45	$10.23	$10.07	$9.95	$9.86	$9.79	$9.73
With Non-Burning Options	$10.53	$10.30	$10.13	$10.00	$9.91	$9.83	$9.76
Costs With Field Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Prepare fields for burning	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44
Burn Permits and Fees	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34
Burn Acreage (@ 90%)	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Incorporate Straw (@ 10%)	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68
Operating Capital @ 9%; Investment @4%	$38.01	$38.75	$39.48	$40.22	$40.96	$41.69	$42.43
Total Operating Cost per Acre	$477.02	$491.06	$505.09	$519.13	$533.17	$547.20	$561.24
Total Operating Cost per cwt	$9.54	$8.18	$7.22	$6.49	$5.92	$5.47	$5.10
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$666.79	$680.83	$694.86	$708.90	$722.94	$736.97	$751.01
Total Cash Costs per cwt	$13.34	$11.35	$9.93	$8.86	$8.03	$7.37	$6.83
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$741.84	$755.88	$769.91	$783.95	$797.99	$812.02	$826.06
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Cost With Alternative to Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Incorporate Straw	$17.60	$17.60	$17.60	$17.60	$17.60	$17.60	$17.60
Remove Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$38.45	$39.19	$39.92	$40.66	$41.40	$42.13	$42.87
Total Operating Cost per Acre	$485.40	$499.44	$513.47	$527.51	$541.55	$555.58	$569.62
Total Operating Cost per cwt	$9.71	$8.32	$7.34	$6.59	$6.02	$5.56	$5.18
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$675.17	$689.21	$703.24	$717.28	$731.32	$745.35	$759.39
Total Cash Costs per cwt	$13.50	$11.49	$10.05	$8.97	$8.13	$7.45	$6.90
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$750.22	$764.26	$778.29	$792.33	$806.37	$820.40	$834.44
Total Costs per cwt	$15.00	$12.74	$11.12	$9.90	$8.96	$8.20	$7.59
Revenues/Costs with Field Burning							
Total Revenue per Acre	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
Total Cost per Acre	$741.84	$764.26	$778.29	$792.33	$806.37	$820.40	$834.44
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Net Revenue Per Acre	($219.17)	($150.39)	($73.23)	$3.94	$81.10	$158.26	$235.43
Revenues/Costs without Field Burning							
Total Revenue per Acre	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Costs per Acre	$750.22	$764.26	$778.29	$792.33	$806.37	$820.40	$834.44
Total Costs per cwt	$15.00	$12.74	$11.12	$9.90	$8.96	$8.20	$7.59
Net Revenue Per Acre	($223.55)	($146.39)	($69.23)	$7.94	$85.10	$162.26	$239.43
Net Benefits or Costs for Alternative							
Per Acre	($4.38)	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00
Per CWT	($0.17)	($0.14)	($0.12)	($0.10)	($0.09)	($0.08)	($0.08)

Burn Alternative #4: Chop Straw, Till Field Once
Farming Operation Type #B
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67
CCC Marketing Loan Program Cash Offset	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00
Total Receipts per Acre							
With Field Burning	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
With Non-Burning Options	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Receipts per cwt							
With Field Burning	$12.45	$11.90	$11.50	$11.20	$10.97	$10.79	$10.64
With Non-Burning Options	$12.65	$12.06	$11.64	$11.33	$11.08	$10.89	$10.73
Costs With Field Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Prepare fields for burning							
Burn Permits and Fees	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48
Burn Acreage (@ 70%)	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50
Incorporate Straw (@ 30%)	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10
Operating Capital @ 9%; Investment @4%	$30.53	$31.27	$32.01	$32.74	$33.48	$34.22	$34.95
Total Operating Cost per Acre	$419.06	$433.10	$447.14	$461.17	$475.21	$489.25	$503.28
Total Operating Cost per cwt	$8.38	$7.22	$6.39	$5.76	$5.28	$4.89	$4.58
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$473.90	$487.94	$501.98	$516.01	$530.05	$544.09	$558.12
Total Cash Costs per cwt	$9.48	$8.13	$7.17	$6.45	$5.89	$5.44	$5.07
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$615.19	$629.23	$643.27	$657.30	$671.34	$685.38	$699.41
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Cost With Alternative to Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Incorporate Straw	$17.60	$17.60	$17.60	$17.60	$17.60	$17.60	$17.60
Remove Straw							
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$31.11	$31.85	$32.59	$33.33	$34.06	$34.80	$35.54
Total Operating Cost per Acre	$430.16	$444.20	$458.24	$472.28	$486.31	$500.35	$514.39
Total Operating Cost per cwt	$8.60	$7.40	$6.55	$5.90	$5.40	$5.00	$4.68
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$485.00	$499.04	$513.08	$527.12	$541.15	$555.19	$569.23
Total Cash Costs per cwt	$9.70	$8.32	$7.33	$6.59	$6.01	$5.55	$5.17
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$626.29	$640.33	$654.37	$668.41	$682.44	$696.48	$710.52
Total Costs per cwt	$12.53	$10.67	$9.35	$8.36	$7.58	$6.96	$6.46
Revenues/Costs with Field Burning							
Total Revenue per Acre	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
Total Cost per Acre	$615.19	$640.33	$654.37	$668.41	$682.44	$696.48	$710.52
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Net Revenue Per Acre	$7.48	$73.54	$150.70	$227.86	$305.02	$382.19	$459.35
Revenues/Costs without Field Burning							
Total Revenue per Acre	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Costs per Acre	$626.29	$640.33	$654.37	$668.41	$682.44	$696.48	$710.52
Total Costs per cwt	$12.53	$10.67	$9.35	$8.36	$7.58	$6.96	$6.46
Net Revenue Per Acre	$6.37	$83.54	$160.70	$237.86	$315.02	$392.19	$469.35
Net Benefits or Costs for Alternative							
Per Acre	($1.10)	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00
Per CWT	($0.22)	($0.19)	($0.16)	($0.14)	($0.12)	($0.11)	($0.10)

Burn Alternative #4: Chop Straw, Till Field Once
Farming Operation Type #C
0% Assumed Yield Reduction

Yields and Revenues	50	60	70	80	90	100	110
Yields/Acre (cwt)							
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11
CCC Marketing Loan Program Cash Offset	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67
Total Receipts per Acre							
With Field Burning	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
With Non-Burning Options	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Receipts per cwt							
With Field Burning	$11.34	$10.97	$10.71	$10.51	$10.35	$10.23	$10.13
With Non-Burning Options	$11.48	$11.08	$10.80	$10.59	$10.43	$10.30	$10.19
Costs With Field Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	$80.39
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$58.30
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Prepare fields for burning	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Permits and Fees	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Acreage	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91
Total Operating Cost per Acre	$344.01	$356.62	$369.23	$381.83	$394.44	$407.05	$419.66
Total Operating Cost per cwt	$6.88	$5.94	$5.27	$4.77	$4.38	$4.07	$3.82
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$555.48	$568.09	$580.70	$593.30	$605.91	$618.52	$631.13
Total Cash Costs per cwt	$11.11	$9.47	$8.30	$7.42	$6.73	$6.19	$5.74
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%; Investment @4%	$32.88	$33.54	$34.20	$34.86	$35.53	$36.19	$36.85
Total Cost per acre	$681.23	$694.50	$707.77	$721.04	$734.31	$747.58	$760.85
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Cost With Alternative to Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	$80.39
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$58.30
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Incorporate Straw	$17.60	$17.60	$17.60	$17.60	$17.60	$17.60	$17.60
Remove Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Operating Cost per Acre	$358.70	$371.31	$383.92	$396.52	$409.13	$421.74	$434.35
Total Operating Cost per cwt	$7.17	$6.19	$5.48	$4.96	$4.55	$4.22	$3.95
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$570.17	$582.78	$595.39	$607.99	$620.60	$633.21	$645.82
Total Cash Costs per cwt	$11.40	$9.71	$8.51	$7.60	$6.90	$6.33	$5.87
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%; Investment @4%	$33.65	$34.31	$34.97	$35.63	$36.30	$36.96	$37.62
Total Cost per acre	$696.69	$709.96	$723.23	$736.50	$749.77	$763.04	$776.31
Total Costs per cwt	$13.93	$11.83	$10.33	$9.21	$8.33	$7.63	$7.06
Revenues/Costs with Field Burning							
Total Revenue per Acre	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
Total Cost per Acre	$681.23	$709.96	$723.23	$736.50	$749.77	$763.04	$776.31
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Net Revenue Per Acre	($114.12)	($51.65)	$26.28	$104.21	$182.14	$260.07	$338.00
Revenues/Costs without Field Burning							
Total Revenue per Acre	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Costs per Acre	$696.69	$709.96	$723.23	$736.50	$749.77	$763.04	$776.31
Total Costs per cwt	$13.93	$11.83	$10.33	$9.21	$8.33	$7.63	$7.06
Net Revenue Per Acre	($122.91)	($44.98)	$32.95	$110.88	$188.81	$266.74	$344.67
Net Benefits or Costs for Alternative							
Per Acre	($8.79)	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67
Per CWT	($0.31)	($0.26)	($0.22)	($0.19)	($0.17)	($0.15)	($0.14)

Burn Alternative #5: Chop Straw, Roll Field Once
Farming Operation Type #A
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67
CCC Marketing Loan Program Cash Offsets	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00
Total Receipts per Acre							
With Field Burning	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
With Non-Burning Options	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Receipts per cwt							
With Field Burning	$10.45	$10.23	$10.07	$9.95	$9.86	$9.79	$9.73
With Non-Burning Options	$10.53	$10.30	$10.13	$10.00	$9.91	$9.83	$9.76
Costs with Field Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Prepare fields for burning	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44
Burn Permits and Fees	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34
Burn Acreage (@ 90%)	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Incorporate Straw (@ 10%)	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68
Operating Capital @ 9%; Investment @4%	$38.01	$38.75	$39.48	$40.22	$40.96	$41.69	$42.43
Total Operating Cost per Acre	$477.02	$491.06	$505.09	$519.13	$533.17	$547.20	$561.24
Total Operating Cost per cwt	$9.54	$8.18	$7.22	$6.49	$5.92	$5.47	$5.10
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$666.79	$680.83	$694.86	$708.90	$722.94	$736.97	$751.01
Total Cash Costs per cwt	$13.34	$11.35	$9.93	$8.86	$8.03	$7.37	$6.83
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$741.84	$755.88	$769.91	$783.95	$797.99	$812.02	$826.06
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Cost With Alternative to Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Incorporate Straw	$6.80	$6.80	$6.80	$6.80	$6.80	$6.80	$6.80
Remove Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$37.85	$38.59	$39.32	$40.06	$40.80	$41.53	$42.27
Total Operating Cost per Acre	$474.00	$488.04	$502.07	$516.11	$530.15	$544.18	$558.22
Total Operating Cost per cwt	$9.48	$8.13	$7.17	$6.45	$5.89	$5.44	$5.07
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$663.77	$677.81	$691.84	$705.88	$719.92	$733.95	$747.99
Total Cash Costs per cwt	$13.28	$11.30	$9.88	$8.82	$8.00	$7.34	$6.80
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$738.82	$752.86	$766.89	$780.93	$794.97	$809.00	$823.04
Total Costs per cwt	$14.78	$12.55	$10.96	$9.76	$8.83	$8.09	$7.48
Net Revenue (with Burning)							
Total Revenue per Acre	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
Total Cost per Acre	$741.84	$755.88	$769.91	$783.95	$797.99	$812.02	$826.06
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Net Revenue Per Acre	($219.17)	($142.01)	($64.85)	$12.32	$89.48	$166.64	$243.81
Net Revenue (without Burning)							
Total Revenue per Acre	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Costs per Acre	$738.82	$752.86	$766.89	$780.93	$794.97	$809.00	$823.04
Total Costs per cwt	$14.78	$12.55	$10.96	$9.76	$8.83	$8.09	$7.48
Net Revenue Per Acre	($212.15)	($134.99)	($57.83)	$19.34	$96.50	$173.66	$250.83
Net Benefits for Non-Burning Alternative							
Per Acre	$7.02	$7.02	$7.02	$7.02	$7.02	$7.02	$7.02
Per CWT	$0.06	$0.05	$0.04	$0.04	$0.03	$0.03	$0.03

Burn Alternative #5: Chop Straw, Roll Field Once
Farming Operation Type #B
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67
CCC Marketing Loan Program Cash Offsets	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00
Total Receipts per Acre							
With Field Burning	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
With Non-Burning Options	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Receipts per cwt							
With Field Burning	$12.45	$11.90	$11.50	$11.20	$10.97	$10.79	$10.64
With Non-Burning Options	$12.65	$12.06	$11.64	$11.33	$11.08	$10.89	$10.73
Costs with Field Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Prepare fields for burning							
Burn Permits and Fees	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48
Burn Acreage (@ 70%)	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50
Incorporate Straw (@ 30%)	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10
Operating Capital @ 9%; Investment @4%	$30.53	$31.27	$32.01	$32.74	$33.48	$34.22	$34.95
Total Operating Cost per Acre	$419.06	$433.10	$447.14	$461.17	$475.21	$489.25	$503.28
Total Operating Cost per cwt	$8.38	$7.22	$6.39	$5.76	$5.28	$4.89	$4.58
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$473.90	$487.94	$501.98	$516.01	$530.05	$544.09	$558.12
Total Cash Costs per cwt	$9.48	$8.13	$7.17	$6.45	$5.89	$5.44	$5.07
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$615.19	$629.23	$643.27	$657.30	$671.34	$685.38	$699.41
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Cost With Alternative to Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Incorporate Straw	$6.80	$6.80	$6.80	$6.80	$6.80	$6.80	$6.80
Remove Straw							
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$30.52	$31.25	$31.99	$32.73	$33.46	$34.20	$34.94
Total Operating Cost per Acre	$418.77	$432.80	$446.84	$460.88	$474.91	$488.95	$502.99
Total Operating Cost per cwt	$8.38	$7.21	$6.38	$5.76	$5.28	$4.89	$4.57
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$473.61	$487.64	$501.68	$515.72	$529.75	$543.79	$557.83
Total Cash Costs per cwt	$9.47	$8.13	$7.17	$6.45	$5.89	$5.44	$5.07
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$614.90	$628.93	$642.97	$657.01	$671.04	$685.08	$699.12
Total Costs per cwt	$12.30	$10.48	$9.19	$8.21	$7.46	$6.85	$6.36
Net Revenue (with Burning)							
Total Revenue per Acre	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
Total Cost per Acre	$615.19	$629.23	$643.27	$657.30	$671.34	$685.38	$699.41
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Net Revenue Per Acre	$7.48	$84.64	$161.80	$238.96	$316.13	$393.29	$470.45
Net Revenue (without Burning)							
Total Revenue per Acre	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Costs per Acre	$614.90	$628.93	$642.97	$657.01	$671.04	$685.08	$699.12
Total Costs per cwt	$12.30	$10.48	$9.19	$8.21	$7.46	$6.85	$6.36
Net Revenue Per Acre	$17.77	$94.93	$172.10	$249.26	$326.42	$403.59	$480.75
Net Benefits for Non-Burning Alternative							
Per Acre	$10.30	$10.30	$10.30	$10.30	$10.30	$10.30	$10.30
Per CWT	$0.01	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Burn Alternative #5: Chop Straw, Roll Field Once
Farming Operation Type #C
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11
CCC Marketing Loan Program Cash Offsets	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67
Total Receipts per Acre							
With Field Burning	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
With Non-Burning Options	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Receipts per cwt							
With Field Burning	$11.34	$10.97	$10.71	$10.51	$10.35	$10.23	$10.13
With Non-Burning Options	$11.48	$11.08	$10.80	$10.59	$10.43	$10.30	$10.19
Costs with Field Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	$80.39
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$58.30
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Prepare fields for burning	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Permits and Fees	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Acreage	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91
Total Operating Cost per Acre	$344.01	$356.62	$369.23	$381.83	$394.44	$407.05	$419.66
Total Operating Cost per cwt	$6.88	$5.94	$5.27	$4.77	$4.38	$4.07	$3.82
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$555.48	$568.09	$580.70	$593.30	$605.91	$618.52	$631.13
Total Cash Costs per cwt	$11.11	$9.47	$8.30	$7.42	$6.73	$6.19	$5.74
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%, Investment @4%	$32.88	$33.54	$34.20	$34.86	$35.53	$36.19	$36.85
Total Cost per acre	$681.23	$694.50	$707.77	$721.04	$734.31	$747.58	$760.85
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Cost With Alternative to Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Incorporate Straw	$6.80	$6.80	$6.80	$6.80	$6.80	$6.80	$6.80
Remove Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Operating Cost per Acre	$347.90	$360.51	$373.12	$385.72	$398.33	$410.94	$423.55
Total Operating Cost per cwt	$6.96	$6.01	$5.33	$4.82	$4.43	$4.11	$3.85
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$559.37	$571.98	$584.59	$597.19	$609.80	$622.41	$635.02
Total Cash Costs per cwt	$11.19	$9.53	$8.35	$7.46	$6.78	$6.22	$5.77
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%, Investment @4%	$33.08	$33.74	$34.41	$35.07	$35.73	$36.39	$37.05
Total Cost per acre	$685.32	$698.59	$711.86	$725.13	$738.40	$751.67	$764.94
Total Costs per cwt	$13.71	$11.64	$10.17	$9.06	$8.20	$7.52	$6.95
Net Revenue (with Burning)							
Total Revenue per Acre	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
Total Cost per Acre	$681.23	$694.50	$707.77	$721.04	$734.31	$747.58	$760.85
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Net Revenue Per Acre	($114.12)	($36.19)	$41.74	$119.67	$197.60	$275.53	$353.46
Net Revenue (without Burning)							
Total Revenue per Acre	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Costs per Acre	$685.32	$698.59	$711.86	$725.13	$738.40	$751.67	$764.94
Total Costs per cwt	$13.71	$11.64	$10.17	$9.06	$8.20	$7.52	$6.95
Net Revenue Per Acre	($111.54)	($33.61)	$44.32	$122.25	$200.18	$278.11	$356.04
Net Benefits for Non-Burning Alternative							
Per Acre	$2.57	$2.57	$2.57	$2.57	$2.57	$2.57	$2.57
Per CWT	($0.08)	($0.07)	($0.06)	($0.05)	($0.05)	($0.04)	($0.04)

Burn Alternative #6: Roll Field Once
Farming Operation Type #A
0% Assumed Yield Reduction

Yields and Revenues	50	60	70	80	90	100	110
Yields/Acre (cwt)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Price/cwt (55/68 Medium Grain)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Yield Change - Non-burning Option (cwt/acre)							
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67
CCC Marketing Loan Program Cash Offsets	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00
Total Receipts per Acre							
With Field Burning	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
With Non-Burning Options	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Receipts per cwt							
With Field Burning	$10.45	$10.23	$10.07	$9.95	$9.86	$9.79	$9.73
With Non-Burning Options	$10.53	$10.30	$10.13	$10.00	$9.91	$9.83	$9.76
Costs with Field Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Prepare fields for burning	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44
Burn Permits and Fees	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34
Burn Acreage (@ 90%)	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Incorporate Straw (@ 10%)	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68
Operating Capital @ 9%; Investment @4%	$38.01	$38.75	$39.48	$40.22	$40.96	$41.69	$42.43
Total Operating Cost per Acre	$477.02	$491.06	$505.09	$519.13	$533.17	$547.20	$561.24
Total Operating Cost per cwt	$9.54	$8.18	$7.22	$6.49	$5.92	$5.47	$5.10
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$666.79	$680.83	$694.86	$708.90	$722.94	$736.97	$751.01
Total Cash Costs per cwt	$13.34	$11.35	$9.93	$8.86	$8.03	$7.37	$6.83
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$741.84	$755.88	$769.91	$783.95	$797.99	$812.02	$826.06
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Cost With Alternative to Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Incorporate Straw	$4.26	$4.26	$4.26	$4.26	$4.26	$4.26	$4.26
Remove Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$37.71	$38.45	$39.18	$39.92	$40.66	$41.39	$42.13
Total Operating Cost per Acre	$471.32	$485.36	$499.39	$513.43	$527.47	$541.50	$555.54
Total Operating Cost per cwt	$9.43	$8.09	$7.13	$6.42	$5.86	$5.42	$5.05
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$661.09	$675.13	$689.16	$703.20	$717.24	$731.27	$745.31
Total Cash Costs per cwt	$13.22	$11.25	$9.85	$8.79	$7.97	$7.31	$6.78
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$736.14	$750.18	$764.21	$778.25	$792.29	$806.32	$820.36
Total Costs per cwt	$14.72	$12.50	$10.92	$9.73	$8.80	$8.06	$7.46
Revenues/Costs with Field Burning							
Total Revenue per Acre	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
Total Cost per Acre	$741.84	$755.88	$769.91	$783.95	$797.99	$812.02	$826.06
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Net Revenue Per Acre	($219.17)	($142.01)	($64.85)	$12.32	$89.48	$166.64	$243.81
Revenues/Costs without Field Burning							
Total Revenue per Acre	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Costs per Acre	$736.14	$750.18	$764.21	$778.25	$792.29	$806.32	$820.36
Total Costs per cwt	$14.72	$12.50	$10.92	$9.73	$8.80	$8.06	$7.46
Net Revenue Per Acre	($209.47)	($132.31)	($55.15)	$22.02	$99.18	$176.34	$253.51
Net Benefits or Costs for Alternative							
Per Acre	$9.70	$9.70	$9.70	$9.70	$9.70	$9.70	$9.70
Per CWT	$0.11	$0.09	$0.08	$0.07	$0.06	$0.06	$0.05

Burn Alternative #6: Roll Field Once
Farming Operation Type #B
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67
CCC Marketing Loan Program Cash Offsets	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00
Total Receipts per Acre							
With Field Burning	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
With Non-Burning Options	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Receipts per cwt							
With Field Burning	$12.45	$11.90	$11.50	$11.20	$10.97	$10.79	$10.64
With Non-Burning Options	$12.65	$12.06	$11.64	$11.33	$11.08	$10.89	$10.73
Costs with Field Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Prepare fields for burning							
Burn Permits and Fees	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48
Burn Acreage (@ 70%)	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50
Incorporate Straw (@ 30%)	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10
Operating Capital @ 9%; Investment @4%	$30.53	$31.27	$32.01	$32.74	$33.48	$34.22	$34.95
Total Operating Cost per Acre	$419.06	$433.10	$447.14	$461.17	$475.21	$489.25	$503.28
Total Operating Cost per cwt	$8.38	$7.22	$6.39	$5.76	$5.28	$4.89	$4.58
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$473.90	$487.94	$501.98	$516.01	$530.05	$544.09	$558.12
Total Cash Costs per cwt	$9.48	$8.13	$7.17	$6.45	$5.89	$5.44	$5.07
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$615.19	$629.23	$643.27	$657.30	$671.34	$685.38	$699.41
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Cost With Alternative to Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Incorporate Straw	$4.26	$4.26	$4.26	$4.26	$4.26	$4.26	$4.26
Remove Straw							
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$30.38	$31.11	$31.85	$32.59	$33.32	$34.06	$34.80
Total Operating Cost per Acre	$416.09	$430.12	$444.16	$458.20	$472.23	$486.27	$500.31
Total Operating Cost per cwt	$8.32	$7.17	$6.35	$5.73	$5.25	$4.86	$4.55
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$470.93	$484.96	$499.00	$513.04	$527.07	$541.11	$555.15
Total Cash Costs per cwt	$9.42	$8.08	$7.13	$6.41	$5.86	$5.41	$5.05
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$612.22	$626.25	$640.29	$654.33	$668.36	$682.40	$696.44
Total Costs per cwt	$12.24	$10.44	$9.15	$8.18	$7.43	$6.82	$6.33
Revenues/Costs with Field Burning							
Total Revenue per Acre	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
Total Cost per Acre	$615.19	$629.23	$643.27	$657.30	$671.34	$685.38	$699.41
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Net Revenue Per Acre	$7.48	$84.64	$161.80	$238.96	$316.13	$393.29	$470.45
Revenues/Costs without Field Burning							
Total Revenue per Acre	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Costs per Acre	$612.22	$626.25	$640.29	$654.33	$668.36	$682.40	$696.44
Total Costs per cwt	$12.24	$10.44	$9.15	$8.18	$7.43	$6.82	$6.33
Net Revenue Per Acre	$20.45	$97.61	$174.78	$251.94	$329.10	$406.27	$483.43
Net Benefits or Costs for Alternative							
Per Acre	$12.98	$12.98	$12.98	$12.98	$12.98	$12.98	$12.98
Per CWT	$0.06	$0.05	$0.04	$0.04	$0.03	$0.03	$0.03

Burn Alternative #6: Roll Field Once
Farming Operation Type #C
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11
CCC Marketing Loan Program Cash Offsets	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67
Total Receipts per Acre							
With Field Burning	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
With Non-Burning Options	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Receipts per cwt							
With Field Burning	$11.34	$10.97	$10.71	$10.51	$10.35	$10.23	$10.13
With Non-Burning Options	$11.48	$11.08	$10.80	$10.59	$10.43	$10.30	$10.19
Costs with Field Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	$80.39
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$58.30
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Prepare fields for burning	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Permits and Fees	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Acreage	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91
Total Operating Cost per Acre	$344.01	$356.62	$369.23	$381.83	$394.44	$407.05	$419.66
Total Operating Cost per cwt	$6.88	$5.94	$5.27	$4.77	$4.38	$4.07	$3.82
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$555.48	$568.09	$580.70	$593.30	$605.91	$618.52	$631.13
Total Cash Costs per cwt	$11.11	$9.47	$8.30	$7.42	$6.73	$6.19	$5.74
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%; Investment @4%	$32.88	$33.54	$34.20	$34.86	$35.53	$36.19	$36.85
Total Cost per acre	$681.23	$694.50	$707.77	$721.04	$734.31	$747.58	$760.85
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Cost With Alternative to Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	$80.39
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$58.30
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Incorporate Straw	$4.26	$4.26	$4.26	$4.26	$4.26	$4.26	$4.26
Remove Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Operating Cost per Acre	$345.36	$357.97	$370.58	$383.18	$395.79	$408.40	$421.01
Total Operating Cost per cwt	$6.91	$5.97	$5.29	$4.79	$4.40	$4.08	$3.83
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$556.83	$569.44	$582.05	$594.65	$607.26	$619.87	$632.48
Total Cash Costs per cwt	$11.14	$9.49	$8.31	$7.43	$6.75	$6.20	$5.75
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%; Investment @4%	$32.95	$33.61	$34.27	$34.93	$35.60	$36.26	$36.92
Total Cost per acre	$682.65	$695.92	$709.19	$722.46	$735.73	$749.00	$762.27
Total Costs per cwt	$13.65	$11.60	$10.13	$9.03	$8.17	$7.49	$6.93
Revenues/Costs with Field Burning							
Total Revenue per Acre	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
Total Cost per Acre	$681.23	$694.50	$707.77	$721.04	$734.31	$747.58	$760.85
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Net Revenue Per Acre	($114.12)	($36.19)	$41.74	$119.67	$197.60	$275.53	$353.46
Revenues/Costs without Field Burning							
Total Revenue per Acre	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Costs per Acre	$682.65	$695.92	$709.19	$722.46	$735.73	$749.00	$762.27
Total Costs per cwt	$13.65	$11.60	$10.13	$9.03	$8.17	$7.49	$6.93
Net Revenue Per Acre	($108.87)	($30.94)	$46.99	$124.92	$202.85	$280.78	$358.71
Net Benefits or Costs for Alternative							
Per Acre	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25
Per CWT	($0.03)	($0.02)	($0.02)	($0.02)	($0.02)	($0.01)	($0.01)

Burn Alternative #7: Rice Straw Removal
Farming Operation Type #A
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67	$66.67
CCC Marketing Loan Program Cash Offsets	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00
Total Receipts per Acre							
With Field Burning	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
With Non-Burning Options	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Receipts per cwt							
With Field Burning	$10.45	$10.23	$10.07	$9.95	$9.86	$9.79	$9.73
With Non-Burning Options	$10.53	$10.30	$10.13	$10.00	$9.91	$9.83	$9.76
Costs with Field Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Prepare fields for burning	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44
Burn Permits and Fees	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34	$0.34
Burn Acreage (@ 90%)	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Incorporate Straw (@ 10%)	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68	$0.68
Operating Capital @ 9%; Investment @4%	$38.01	$38.75	$39.48	$40.22	$40.96	$41.69	$42.43
Total Operating Cost per Acre	$477.02	$491.06	$505.09	$519.13	$533.17	$547.20	$561.24
Total Operating Cost per cwt	$9.54	$8.18	$7.22	$6.49	$5.92	$5.47	$5.10
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$666.79	$680.83	$694.86	$708.90	$722.94	$736.97	$751.01
Total Cash Costs per cwt	$13.34	$11.35	$9.93	$8.86	$8.03	$7.37	$6.83
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$741.84	$755.88	$769.91	$783.95	$797.99	$812.02	$826.06
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Cost With Alternative to Burning							
Cultural Operations	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13	$306.13
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72	$56.72
Post Harvest Operations							
Incorporate Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Remove Straw	$58.00	$58.00	$58.00	$58.00	$58.00	$58.00	$58.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$40.69	$41.42	$42.16	$42.90	$43.63	$44.37	$45.11
Total Operating Cost per Acre	$528.04	$542.07	$556.11	$570.15	$584.18	$598.22	$612.26
Total Operating Cost per cwt	$10.56	$9.03	$7.94	$7.13	$6.49	$5.98	$5.57
Cash Overhead	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77	$189.77
Total Cash Costs per Acre	$717.81	$731.84	$745.88	$759.92	$773.95	$787.99	$802.03
Total Cash Costs per cwt	$14.36	$12.20	$10.66	$9.50	$8.60	$7.88	$7.29
Non-Cash Overhead	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05	$75.05
Total Cost per acre	$792.86	$806.89	$820.93	$834.97	$849.00	$863.04	$877.08
Total Costs per cwt	$15.86	$13.45	$11.73	$10.44	$9.43	$8.63	$7.97
Revenues/Costs with Field Burning							
Total Revenue per Acre	$522.67	$613.87	$705.07	$796.27	$887.47	$978.67	$1,069.87
Total Cost per Acre	$741.84	$755.88	$769.91	$783.95	$797.99	$812.02	$826.06
Total Costs per cwt	$14.84	$12.60	$11.00	$9.80	$8.87	$8.12	$7.51
Net Revenue Per Acre	($219.17)	($142.01)	($64.85)	$12.32	$89.48	$166.64	$243.81
Revenues/Costs without Field Burning							
Total Revenue per Acre	$526.67	$617.87	$709.07	$800.27	$891.47	$982.67	$1,073.87
Total Cost per Acre	$792.86	$806.89	$820.93	$834.97	$849.00	$863.04	$877.08
Total Costs per cwt	$15.86	$13.45	$11.73	$10.44	$9.43	$8.63	$7.97
Net Revenue Per Acre	($266.19)	($189.03)	($111.86)	($34.70)	$42.46	$119.63	$196.79
Net Benefits or Costs for Alternative							
Per Acre	($47.02)	($47.02)	($47.02)	($47.02)	($47.02)	($47.02)	($47.02)
Per CWT	($1.02)	($0.85)	($0.73)	($0.64)	($0.57)	($0.51)	($0.46)

Burn Alternative #7: Rice Straw Removal
Farming Operation Type #B
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67	$166.67
CCC Marketing Loan Program Cash Offsets	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00
Total Receipts per Acre							
With Field Burning	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
With Non-Burning Options	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Receipts per cwt							
With Field Burning	$12.45	$11.90	$11.50	$11.20	$10.97	$10.79	$10.64
With Non-Burning Options	$12.65	$12.06	$11.64	$11.33	$11.08	$10.89	$10.73
Costs Without Alternatives to Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Prepare fields for burning							
Burn Permits and Fees	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48	$0.48
Burn Acreage (@ 70%)	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50
Incorporate Straw (@ 30%)	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10	$3.10
Operating Capital @ 9%; Investment @4%	$30.53	$31.27	$32.01	$32.74	$33.48	$34.22	$34.95
Total Operating Cost per Acre	$419.06	$433.10	$447.14	$461.17	$475.21	$489.25	$503.28
Total Operating Cost per cwt	$8.38	$7.22	$6.39	$5.76	$5.28	$4.89	$4.58
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$473.90	$487.94	$501.98	$516.01	$530.05	$544.09	$558.12
Total Cash Costs per cwt	$9.48	$8.13	$7.17	$6.45	$5.89	$5.44	$5.07
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$615.19	$629.23	$643.27	$657.30	$671.34	$685.38	$699.41
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Cost With Alternative to Burning							
Cultural Operations	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17	$284.17
Harvest Operations							
Dry Green Rice	$39.00	$46.80	$54.60	$62.40	$70.20	$78.00	$85.80
Store Rice	$27.50	$33.00	$38.50	$44.00	$49.50	$55.00	$60.50
Other Harvest Operations	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78	$30.78
Post Harvest Operations							
Incorporate Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Remove Straw	$58.00	$58.00	$58.00	$58.00	$58.00	$58.00	$58.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Capital @ 9%; Investment @4%	$33.35	$34.09	$34.83	$35.56	$36.30	$37.04	$37.77
Total Operating Cost per Acre	$472.80	$486.84	$500.88	$514.91	$528.95	$542.99	$557.02
Total Operating Cost per cwt	$9.46	$8.11	$7.16	$6.44	$5.88	$5.43	$5.06
Cash Overhead	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84	$54.84
Total Cash Costs per Acre	$527.64	$541.68	$555.72	$569.75	$583.79	$597.83	$611.86
Total Cash Costs per cwt	$10.55	$9.03	$7.94	$7.12	$6.49	$5.98	$5.56
Non-Cash Overhead	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29	$141.29
Total Cost per acre	$668.93	$682.97	$697.01	$711.04	$725.08	$739.12	$753.15
Total Costs per cwt	$13.38	$11.38	$9.96	$8.89	$8.06	$7.39	$6.85
Revenues/Costs with Field Burning							
Total Revenue per Acre	$622.67	$713.87	$805.07	$896.27	$987.47	$1,078.67	$1,169.87
Total Cost per Acre	$615.19	$629.23	$643.27	$657.30	$671.34	$685.38	$699.41
Total Costs per cwt	$12.30	$10.49	$9.19	$8.22	$7.46	$6.85	$6.36
Net Revenue Per Acre	$7.48	$84.64	$161.80	$238.96	$316.13	$393.29	$470.45
Revenues/Costs without Field Burning							
Total Revenue per Acre	$632.67	$723.87	$815.07	$906.27	$997.47	$1,088.67	$1,179.87
Total Costs per Acre	$668.93	$682.97	$697.01	$711.04	$725.08	$739.12	$753.15
Total Costs per cwt	$13.38	$11.38	$9.96	$8.89	$8.06	$7.39	$6.85
Net Revenue Per Acre	($36.27)	$40.90	$118.06	$195.22	$272.39	$349.55	$426.71
Net Benefits or Costs for Alternative							
Per Acre	($43.74)	($43.74)	($43.74)	($43.74)	($43.74)	($43.74)	($43.74)
Per CWT	($1.07)	($0.90)	($0.77)	($0.67)	($0.60)	($0.54)	($0.49)

Burn Alternative #7: Rice Straw Removal
Farming Operation Type #C
0% Assumed Yield Reduction

Yields and Revenues							
Yields/Acre (cwt)	50	60	70	80	90	100	110
Price/cwt (55/68 Medium Grain)	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05	$6.05
Yield Change - Non-burning Option (cwt/acre)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue per Acre							
With Field Burning	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
With Non-Burning Options	$302.50	$363.00	$423.50	$484.00	$544.50	$605.00	$665.50
Government Crop Program Payments per Acre	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11	$111.11
CCC Marketing Loan Program Cash Offsets	$153.50	$184.20	$214.90	$245.60	$276.30	$307.00	$337.70
SP-56 Rice Residue Management Cost Share	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67
Total Receipts per Acre							
With Field Burning	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
With Non-Burning Options	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Receipts per cwt							
With Field Burning	$11.34	$10.97	$10.71	$10.51	$10.35	$10.23	$10.13
With Non-Burning Options	$11.48	$11.08	$10.80	$10.59	$10.43	$10.30	$10.19
Costs Without Alternatives to Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	$80.39
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$58.30
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Prepare fields for burning	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Permits and Fees	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Burn Acreage	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91	$2.91
Total Operating Cost per Acre	$344.01	$356.62	$369.23	$381.83	$394.44	$407.05	$419.66
Total Operating Cost per cwt	$6.88	$5.94	$5.27	$4.77	$4.38	$4.07	$3.82
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$555.48	$568.09	$580.70	$593.30	$605.91	$618.52	$631.13
Total Cash Costs per cwt	$11.11	$9.47	$8.30	$7.42	$6.73	$6.19	$5.74
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%; Investment @4%	$32.88	$33.54	$34.20	$34.86	$35.53	$36.19	$36.85
Total Cost per acre	$681.23	$694.50	$707.77	$721.04	$734.31	$747.58	$760.85
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Cost With Alternative to Burning							
Cultural Operations	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21	$233.21
Harvest Operations							
Dry Green Rice	$36.54	$43.85	$51.16	$58.46	$65.77	$73.08	$80.39
Store Rice	$26.50	$31.80	$37.10	$42.40	$47.70	$53.00	$58.30
Other Harvest Operations	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85	$44.85
Post Harvest Operations							
Incorporate Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Remove Straw	$58.00	$58.00	$58.00	$58.00	$58.00	$58.00	$58.00
Value of Residual Straw	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Operating Cost per Acre	$399.10	$411.71	$424.32	$436.92	$449.53	$462.14	$474.75
Total Operating Cost per cwt	$7.98	$6.86	$6.06	$5.46	$4.99	$4.62	$4.32
Cash Overhead	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47	$211.47
Total Cash Costs per Acre	$610.57	$623.18	$635.79	$648.39	$661.00	$673.61	$686.22
Total Cash Costs per cwt	$12.21	$10.39	$9.08	$8.10	$7.34	$6.74	$6.24
Non-Cash Overhead (Investment)	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87	$92.87
Operating Capital @ 9%; Investment @4%	$35.77	$36.43	$37.09	$37.76	$38.42	$39.08	$39.74
Total Cost per acre	$739.21	$752.48	$765.75	$779.02	$792.29	$805.56	$818.83
Total Costs per cwt	$14.78	$12.54	$10.94	$9.74	$8.80	$8.06	$7.44
Revenues/Costs with Field Burning							
Total Revenue per Acre	$567.11	$658.31	$749.51	$840.71	$931.91	$1,023.11	$1,114.31
Total Cost per Acre	$681.23	$694.50	$707.77	$721.04	$734.31	$747.58	$760.85
Total Costs per cwt	$13.62	$11.57	$10.11	$9.01	$8.16	$7.48	$6.92
Net Revenue Per Acre	($114.12)	($36.19)	$41.74	$119.67	$197.60	$275.53	$353.46
Revenues/Costs without Field Burning							
Total Revenue per Acre	$573.78	$664.98	$756.18	$847.38	$938.58	$1,029.78	$1,120.98
Total Costs per Acre	$739.21	$752.48	$765.75	$779.02	$792.29	$805.56	$818.83
Total Costs per cwt	$14.78	$12.54	$10.94	$9.74	$8.80	$8.06	$7.44
Net Revenue Per Acre	($165.43)	($87.50)	($9.57)	$68.36	$146.29	$224.22	$302.15
Net Benefits or Costs for Alternative							
Per Acre	($51.32)	($51.32)	($51.32)	($51.32)	($51.32)	($51.32)	($51.32)
Per CWT	($1.16)	($0.97)	($0.83)	($0.72)	($0.64)	($0.58)	($0.53)

Farm Type A
Typical Yolo County - 1989

Farm Revenues							
Yield cwt/Acre	40	45	50	55	60	65	
Acreage	900	900	900	900	900	900	$
Price/cwt	$6.40	$6.40	$6.40	$6.40	$6.40	$6.40	$6.
ASCS Payment/cwt	$0.53	$0.53	$0.53	$0.53	$0.53	$0.53	$0.
Revenue/Acre	$277.33	$312.00	$346.67	$381.33	$416.00	$450.67	$485.
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$83.14	$83.14	$83.14	$83.14	$83.14	$83.14	$83.
Interest on Operating Capital							
Harvest Costs	$15.04	$15.04	$15.04	$15.04	$15.04	$15.04	$15
Post Harvest Costs	$7.58	$7.58	$7.58	$7.58	$7.58	$7.58	$7
Cash Overhead Costs	$40.83	$40.83	$40.83	$40.83	$40.83	$40.83	$40
Land Rent	$77.65	$87.36	$97.07	$106.77	$116.48	$126.19	$135
Total Cash Costs	$224.24	$233.95	$243.66	$253.36	$263.07	$272.78	$282
Total Cash Costs/cwt	$5.61	$5.20	$4.87	$4.61	$4.38	$4.20	$4
Depreciation							
Total Investment Costs	$28.82	$28.82	$28.82	$28.82	$28.82	$28.82	$28
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$83.14	$83.14	$83.14	$83.14	$83.14	$83.14	$83
Interest on Operating Capital							
Harvest Costs	$15.04	$15.04	$15.04	$15.04	$15.04	$15.04	$15
Post Harvest Costs	$7.58	$7.58	$7.58	$7.58	$7.58	$7.58	$7
Additional Post Harvest Costs (Incorporation)							
Increased Tilling	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9
Increased Fertilization	$7.50	$7.50	$7.50	$7.50	$7.50	$7.50	$7
Additional Post Harvest Costs (Removal)							
Collection Costs	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20
Transportation (3 tons/acre)	$25.20	$25.20	$25.20	$25.20	$25.20	$25.20	$25
Cash Overhead Costs	$40.83	$40.83	$40.83	$40.83	$40.83	$40.83	$40
Land Rent	$77.65	$87.36	$97.07	$106.77	$116.48	$126.19	$135
Total Cash Costs (Incorporation)	$240.74	$250.45	$260.16	$269.86	$279.57	$289.28	$298
Total Cash Costs/cwt (Incorporation)	$6.02	$5.57	$5.20	$4.91	$4.66	$4.45	$4
Total Cash Costs (Removal)	$269.44	$279.15	$288.86	$298.56	$308.27	$317.98	$327
Total Cash Costs/cwt (Removal)	$6.74	$6.20	$5.78	$5.43	$5.14	$4.89	$4
Depreciation							
Total Investment Costs	$28.82	$28.82	$28.82	$28.82	$28.82	$28.82	$28
Total Costs per acre (Burning)	$224.24	$233.95	$243.66	$253.36	$263.07	$272.78	$28.
Total costs per cwt (Burning)	$5.61	$5.20	$4.87	$4.61	$4.38	$4.20	$4
Total Costs per acre (Incorporation)	$240.74	$250.45	$260.16	$269.86	$279.57	$289.28	$29.
Total costs per cwt (Incorporation)	$6.02	$5.57	$5.20	$4.91	$4.66	$4.45	$
Total Costs per acre (Removal)	$269.44	$279.15	$288.86	$298.56	$308.27	$317.98	$32
Total costs per cwt (Removal)	$6.74	$6.20	$5.78	$5.43	$5.14	$4.89	$
Total Net Revenue (Burning)	$47,781.00	$70,245.00	$92,709.00	$115,173.00	$137,637.00	$160,101.00	$182,56
Total Net Revenue (Incorporation)	$32,931.00	$55,395.00	$77,859.00	$100,323.00	$122,787.00	$145,251.00	$167,71
Total Net Revenue (Removal)	$7,101.00	$29,565.00	$52,029.00	$74,493.00	$96,957.00	$119,421.00	$141,88
Total Net Revenue/acre (Burning)	$53.09	$78.05	$103.01	$127.97	$152.93	$177.89	$20
Total Net Revenue/acre (Incorporation	$36.59	$61.55	$86.51	$111.47	$136.43	$161.39	$18
Total Net Revenue/acre (Removal)	$7.89	$32.85	$57.81	$82.77	$107.73	$132.69	$15
Net Revenue/cwt (Burning)	$1.33	$1.73	$2.06	$2.33	$2.55	$2.74	$
Net Revenue/cwt (Incorporation)	$0.91	$1.37	$1.73	$2.03	$2.27	$2.48	$
Net Revenue/cwt (Removal)	$0.20	$0.73	$1.16	$1.50	$1.80	$2.04	$

Farm Type B
Typical Glenn County 1990

Farm Revenues							
Yield cwt/Acre	35	40	45	50	55	60	65
Acreage	375	375	375	375	375	375	375
Price/cwt	$5.38	$5.38	$5.38	$5.38	$5.38	$5.38	$5.38
ASCS Payment/cwt	$2.13	$2.13	$2.13	$2.13	$2.13	$2.13	$2.13
Revenue/Acre	$262.97	$300.53	$338.10	$375.67	$413.23	$450.80	$488.37
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$151.08	$151.08	$151.08	$151.08	$151.08	$151.08	$151.08
Interest on Operating Capital	$9.54	$9.54	$9.54	$9.54	$9.54	$9.54	$9.54
Harvest Costs	$11.86	$11.86	$11.86	$11.86	$11.86	$11.86	$11.86
Post Harvest Costs							
Cash Overhead Costs	$72.10	$72.10	$72.10	$72.10	$72.10	$72.10	$72.10
Land Rent	$65.74	$75.13	$84.53	$93.92	$103.31	$112.70	$122.09
Total Cash Costs	$310.32	$319.71	$329.11	$338.50	$347.89	$357.28	$366.67
Total Cash Costs/cwt	$8.87	$7.99	$7.31	$6.77	$6.33	$5.95	$5.64
Depreciation							
Total Investment Costs	$47.76	$47.76	$47.76	$47.76	$47.76	$47.76	$47.76
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$151.08	$151.08	$151.08	$151.08	$151.08	$151.08	$151.08
Interest on Operating Capital	$9.54	$9.54	$9.54	$9.54	$9.54	$9.54	$9.54
Harvest Costs	$11.86	$11.86	$11.86	$11.86	$11.86	$11.86	$11.86
Post Harvest Costs							
Additional Post Harvest Costs (Incorporation)							
Increased Tilling	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Increased Fertilization	$7.50	$7.50	$7.50	$7.50	$7.50	$7.50	$7.50
Additional Post Harvest Costs (Removal)							
Collection Costs	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00
Transportation (3 tons/acre)	$25.20	$25.20	$25.20	$25.20	$25.20	$25.20	$25.20
Cash Overhead Costs	$72.10	$72.10	$72.10	$72.10	$72.10	$72.10	$72.10
Land Rent	$65.74	$75.13	$84.53	$93.92	$103.31	$112.70	$122.09
Total Cash Costs (Incorporation)	$326.82	$336.21	$345.61	$355.00	$364.39	$373.78	$383.17
Total Cash Costs/cwt (Incorporation)	$9.34	$8.41	$7.68	$7.10	$6.63	$6.23	$5.89
Total Cash Costs (Removal)	$355.52	$364.91	$374.31	$383.70	$393.09	$402.48	$411.87
Total Cash Costs/cwt (Removal)	$10.16	$9.12	$8.32	$7.67	$7.15	$6.71	$6.34
Depreciation							
Total Investment Costs	$47.76	$47.76	$47.76	$47.76	$47.76	$47.76	$47.76
Total Costs per acre (Burning)	$310.32	$319.71	$329.11	$338.50	$347.89	$357.28	$366.67
Total costs per cwt (Burning)	$8.87	$7.99	$7.31	$6.77	$6.33	$5.95	$5.64
Total Costs per acre (Incorporation)	$326.82	$336.21	$345.61	$355.00	$364.39	$373.78	$383.17
Total costs per cwt (Incorporation)	$9.34	$8.41	$7.68	$7.10	$6.63	$6.23	$5.89
Total Costs per acre (Removal)	$355.52	$364.91	$374.31	$383.70	$393.09	$402.48	$411.87
Total costs per cwt (Removal)	$10.16	$9.12	$8.32	$7.67	$7.15	$6.71	$6.34
Total Net Revenue (Burning)	($17,758.13)	($7,192.50)	$3,373.12	$13,938.75	$24,504.38	$35,070.00	$45,635.63
Total Net Revenue (Incorporation)	($23,945.63)	($13,380.00)	($2,814.38)	$7,751.25	$18,316.88	$28,882.50	$39,448.13
Total Net Revenue (Removal)	($34,708.13)	($24,142.50)	($13,576.88)	($3,011.25)	$7,554.37	$18,120.00	$28,685.63
Total Net Revenue/acre (Burning)	($47.36)	($19.18)	$8.99	$37.17	$65.35	$93.52	$121.70
Total Net Revenue/acre (Incorporation	($63.86)	($35.68)	($7.51)	$20.67	$48.85	$77.02	$105.20
Total Net Revenue/acre (Removal)	($92.56)	($64.38)	($36.21)	($8.03)	$20.14	$48.32	$76.50
Net Revenue/cwt (Burning)	($1.35)	($0.48)	$0.20	$0.74	$1.19	$1.56	$1.87
Net Revenue/cwt (Incorporation)	($1.82)	($0.89)	($0.17)	$0.41	$0.89	$1.28	$1.62
Net Revenue/cwt (Removal)	($2.64)	($1.61)	($0.80)	($0.16)	$0.37	$0.81	$1.18

Farm Type B
Typical Glenn County 1990

Farm Revenues							
Yield cwt/Acre	35	40	45	50	55	60	6
Acreage	375	375	375	375	375	375	37
Price/cwt	$5.38	$5.38	$5.38	$5.38	$5.38	$5.38	$5.3
ASCS Payment/cwt	$2.13	$2.13	$2.13	$2.13	$2.13	$2.13	$2.1
Revenue/Acre	$262.97	$300.53	$338.10	$375.67	$413.23	$450.80	$488.3
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$151.08	$151.08	$151.08	$151.08	$151.08	$151.08	$151.0
Interest on Operating Capital	$9.54	$9.54	$9.54	$9.54	$9.54	$9.54	$9.5
Harvest Costs	$11.86	$11.86	$11.86	$11.86	$11.86	$11.86	$11.8
Post Harvest Costs							
Cash Overhead Costs	$72.10	$72.10	$72.10	$72.10	$72.10	$72.10	$72.1
Land Rent	$65.74	$75.13	$84.53	$93.92	$103.31	$112.70	$122.0
Total Cash Costs	$310.32	$319.71	$329.11	$338.50	$347.89	$357.28	$366.6
Total Cash Costs/cwt	$8.87	$7.99	$7.31	$6.77	$6.33	$5.95	$5.6
Depreciation							
Total Investment Costs	$47.76	$47.76	$47.76	$47.76	$47.76	$47.76	$47.7
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$151.08	$151.08	$151.08	$151.08	$151.08	$151.08	$151.0
Interest on Operating Capital	$9.54	$9.54	$9.54	$9.54	$9.54	$9.54	$9.5
Harvest Costs	$11.86	$11.86	$11.86	$11.86	$11.86	$11.86	$11.8
Post Harvest Costs							
Additional Post Harvest Costs (Incorporation)							
Increased Tilling	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.0
Increased Fertilization	$7.50	$7.50	$7.50	$7.50	$7.50	$7.50	$7.5
Additional Post Harvest Costs (Removal)							
Collection Costs	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.0
Transportation (3 tons/acre)	$25.20	$25.20	$25.20	$25.20	$25.20	$25.20	$25.
Cash Overhead Costs	$72.10	$72.10	$72.10	$72.10	$72.10	$72.10	$72.
Land Rent	$65.74	$75.13	$84.53	$93.92	$103.31	$112.70	$122.
Total Cash Costs (Incorporation)	$326.82	$336.21	$345.61	$355.00	$364.39	$373.78	$383.
Total Cash Costs/cwt (Incorporation)	$9.34	$8.41	$7.68	$7.10	$6.63	$6.23	$5.
Total Cash Costs (Removal)	$355.52	$364.91	$374.31	$383.70	$393.09	$402.48	$411.
Total Cash Costs/cwt (Removal)	$10.16	$9.12	$8.32	$7.67	$7.15	$6.71	$6.
Depreciation							
Total Investment Costs	$47.76	$47.76	$47.76	$47.76	$47.76	$47.76	$47
Total Costs per acre (Burning)	$310.32	$319.71	$329.11	$338.50	$347.89	$357.28	$366
Total costs per cwt (Burning)	$8.87	$7.99	$7.31	$6.77	$6.33	$5.95	$5
Total Costs per acre (Incorporation)	$326.82	$336.21	$345.61	$355.00	$364.39	$373.78	$383
Total costs per cwt (Incorporation)	$9.34	$8.41	$7.68	$7.10	$6.63	$6.23	$5
Total Costs per acre (Removal)	$355.52	$364.91	$374.31	$383.70	$393.09	$402.48	$411
Total costs per cwt (Removal)	$10.16	$9.12	$8.32	$7.67	$7.15	$6.71	$6
Total Net Revenue (Burning)	($17,758.13)	($7,192.50)	$3,373.12	$13,938.75	$24,504.38	$35,070.00	$45,635
Total Net Revenue (Incorporation)	($23,945.63)	($13,380.00)	($2,814.38)	$7,751.25	$18,316.88	$28,882.50	$39,448
Total Net Revenue (Removal)	($34,708.13)	($24,142.50)	($13,576.88)	($3,011.25)	$7,554.37	$18,120.00	$28,685
Total Net Revenue/acre (Burning)	($47.36)	($19.18)	$8.99	$37.17	$65.35	$93.52	$12
Total Net Revenue/acre (Incorporation	($63.86)	($35.68)	($7.51)	$20.67	$48.85	$77.02	$10
Total Net Revenue/acre (Removal)	($92.56)	($64.38)	($36.21)	($8.03)	$20.14	$48.32	$7
Net Revenue/cwt (Burning)	($1.35)	($0.48)	$0.20	$0.74	$1.19	$1.56	$
Net Revenue/cwt (Incorporation)	($1.82)	($0.89)	($0.17)	$0.41	$0.89	$1.28	$
Net Revenue/cwt (Removal)	($2.64)	($1.61)	($0.80)	($0.16)	$0.37	$0.81	$

Farm Type C
Typical Sacramento County 1989 - Mineral Soil

Farm Revenues							
Yield cwt/Acre	41	46	51	56	61	66	71
Acreage							
Price/cwt	$6.40	$6.40	$6.40	$6.40	$6.40	$6.40	$6.40
ASCS Payment/cwt	$0.53	$0.53	$0.53	$0.53	$0.53	$0.53	$0.53
Revenue/Acre	$284.27	$318.93	$353.60	$388.27	$422.93	$457.60	$492.27
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$149.72	$149.72	$149.72	$149.72	$149.72	$149.72	$149.72
Interest on Operating Capital	$30.68	$30.68	$30.68	$30.68	$30.68	$30.68	$30.68
Harvest Costs	$32.60	$32.60	$32.60	$32.60	$32.60	$32.60	$32.60
Post Harvest Costs	NA	NA	NA	NA	NA	NA	NA
Cash Overhead Costs	$100.47	$100.47	$100.47	$100.47	$100.47	$100.47	$100.47
Land Rent	$42.64	$47.84	$53.04	$58.24	$63.44	$68.64	$73.84
Total Cash Costs	$356.11	$361.31	$366.51	$371.71	$376.91	$382.11	$387.31
Total Cash Costs/cwt	$8.69	$7.85	$7.19	$6.64	$6.18	$5.79	$5.46
Depreciation	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33
Total Investment Costs	$23.57	$23.57	$23.57	$23.57	$23.57	$23.57	$23.57
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$149.72	$149.72	$149.72	$149.72	$149.72	$149.72	$149.72
Interest on Operating Capital	$30.68	$30.68	$30.68	$30.68	$30.68	$30.68	$30.68
Harvest Costs	$32.60	$32.60	$32.60	$32.60	$32.60	$32.60	$32.60
Post Harvest Costs	NA	NA	NA	NA	NA	NA	NA
Additional Post Harvest Costs (Incorporation)							
Increased Tilling	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Increased Fertilization	$7.50	$7.50	$7.50	$7.50	$7.50	$7.50	$7.50
Additional Post Harvest Costs (Removal)							
Collection Costs	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00
Transportation (3 tons/acre)	$25.20	$25.20	$25.20	$25.20	$25.20	$25.20	$25.20
Cash Overhead Costs	$100.47	$100.47	$100.47	$100.47	$100.47	$100.47	$100.47
Land Rent	$42.64	$47.84	$53.04	$58.24	$63.44	$68.64	$73.84
Total Cash Costs (Incorporation)	$372.61	$377.81	$383.01	$388.21	$393.41	$398.61	$403.81
Total Cash Costs/cwt (Incorporation)	$9.09	$8.21	$7.51	$6.93	$6.45	$6.04	$5.69
Total Cash Costs (Removal)	$401.31	$406.51	$411.71	$416.91	$422.11	$427.31	$432.51
Total Cash Costs/cwt (Removal)	$9.79	$8.84	$8.07	$7.44	$6.92	$6.47	$6.09
Depreciation	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33
Total Investment Costs	$23.57	$23.57	$23.57	$23.57	$23.57	$23.57	$23.57
Total Costs per acre (Burning)	$356.11	$361.31	$366.51	$371.71	$376.91	$382.11	$387.31
Total costs per cwt (Burning)	$8.69	$7.85	$7.19	$6.64	$6.18	$5.79	$5.46
Total Costs per acre (Incorporation)	$372.61	$377.81	$383.01	$388.21	$393.41	$398.61	$403.81
Total costs per cwt (Incorporation)	$9.09	$8.21	$7.51	$6.93	$6.45	$6.04	$5.69
Total Costs per acre (Removal)	$401.31	$406.51	$411.71	$416.91	$422.11	$427.31	$432.51
Total costs per cwt (Removal)	$9.79	$8.84	$8.07	$7.44	$6.92	$6.47	$6.09
Total Net Revenue (Burning)							
Total Net Revenue (Incorporation)							
Total Net Revenue (Removal)							
Total Net Revenue/acre (Burning)	($71.84)	($42.38)	($12.91)	$16.56	$46.02	$75.49	$104.96
Total Net Revenue/acre (Incorporation)	($88.34)	($58.88)	($29.41)	$0.06	$29.52	$58.99	$88.46
Total Net Revenue/acre (Removal)	($117.04)	($87.58)	($58.11)	($28.64)	$0.82	$30.29	$59.76
Net Revenue/cwt (Burning)	($1.75)	($0.92)	($0.25)	$0.30	$0.75	$1.14	$1.48
Net Revenue/cwt (Incorporation)	($2.15)	($1.28)	($0.58)	$0.00	$0.48	$0.89	$1.25
Net Revenue/cwt (Removal)	($2.85)	($1.90)	($1.14)	($0.51)	$0.01	$0.46	$0.84

Farm Type D
Typical Sacramento County 1989 - Peat Soil

Farm Revenues							
Yield cwt/Acre	41	46	51	56	61	66	71
Acreage							
Price/cwt	$6.40	$6.40	$6.40	$6.40	$6.40	$6.40	$6.40
ASCS Payment/cwt	$0.53	$0.53	$0.53	$0.53	$0.53	$0.53	$0.53
Revenue/Acre	$284.27	$318.93	$353.60	$388.27	$422.93	$457.60	$492.27
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$60.72	$60.72	$60.72	$60.72	$60.72	$60.72	$60.72
Interest on Operating Capital	$30.68	$30.68	$30.68	$30.68	$30.68	$30.68	$30.68
Harvest Costs	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75
Post Harvest Costs	NA	NA	NA	NA	NA	NA	NA
Cash Overhead Costs	$92.60	$92.60	$92.60	$92.60	$92.60	$92.60	$92.60
Land Rent	$42.64	$47.84	$53.04	$58.24	$63.44	$68.64	$73.84
Total Cash Costs	$237.39	$242.59	$247.79	$252.99	$258.19	$263.39	$268.59
Total Cash Costs/cwt	$5.79	$5.27	$4.86	$4.52	$4.23	$3.99	$3.78
Depreciation	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33
Total Investment Costs	$23.57	$23.57	$23.57	$23.57	$23.57	$23.57	$23.57
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$60.72	$60.72	$60.72	$60.72	$60.72	$60.72	$60.72
Interest on Operating Capital	$30.68	$30.68	$30.68	$30.68	$30.68	$30.68	$30.68
Harvest Costs	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75
Post Harvest Costs	NA	NA	NA	NA	NA	NA	NA
Additional Post Harvest Costs (Incorporation)							
Increased Tilling	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Increased Fertilization	$7.50	$7.50	$7.50	$7.50	$7.50	$7.50	$7.50
Additional Post Harvest Costs (Removal)							
Collection Costs	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00
Transportation (3 tons/acre)	$25.20	$25.20	$25.20	$25.20	$25.20	$25.20	$25.20
Cash Overhead Costs	$92.60	$92.60	$92.60	$92.60	$92.60	$92.60	$92.60
Land Rent	$42.64	$47.84	$53.04	$58.24	$63.44	$68.64	$73.84
Total Cash Costs (Incorporation)	$253.89	$259.09	$264.29	$269.49	$274.69	$279.89	$285.09
Total Cash Costs/cwt (Incorporation)	$6.19	$5.63	$5.18	$4.81	$4.50	$4.24	$4.02
Total Cash Costs (Removal)	$282.59	$287.79	$292.99	$298.19	$303.39	$308.59	$313.79
Total Cash Costs/cwt (Removal)	$6.89	$6.26	$5.74	$5.32	$4.97	$4.68	$4.42
Depreciation	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33
Total Investment Costs	$23.57	$23.57	$23.57	$23.57	$23.57	$23.57	$23.57
Total Costs per acre (Burning)	$237.39	$242.59	$247.79	$252.99	$258.19	$263.39	$268.59
Total costs per cwt (Burning)	$5.79	$5.27	$4.86	$4.52	$4.23	$3.99	$3.78
Total Costs per acre (Incorporation)	$253.89	$259.09	$264.29	$269.49	$274.69	$279.89	$285.09
Total costs per cwt (Incorporation)	$6.19	$5.63	$5.18	$4.81	$4.50	$4.24	$4.02
Total Costs per acre (Removal)	$282.59	$287.79	$292.99	$298.19	$303.39	$308.59	$313.79
Total costs per cwt (Removal)	$6.89	$6.26	$5.74	$5.32	$4.97	$4.68	$4.42
Total Net Revenue (Burning)							
Total Net Revenue (Incorporation)							
Total Net Revenue (Removal)							
Total Net Revenue/acre (Burning)	$46.88	$76.34	$105.81	$135.28	$164.74	$194.21	$223.68
Total Net Revenue/acre (Incorporation)	$30.38	$59.84	$89.31	$118.78	$148.24	$177.71	$207.18
Total Net Revenue/acre (Removal)	$1.68	$31.14	$60.61	$90.08	$119.54	$149.01	$178.48
Net Revenue/cwt (Burning)	$1.14	$1.66	$2.07	$2.42	$2.70	$2.94	$3.15
Net Revenue/cwt (Incorporation)	$0.74	$1.30	$1.75	$2.12	$2.43	$2.69	$2.92
Net Revenue/cwt (Removal)	$0.04	$0.68	$1.19	$1.61	$1.96	$2.26	$2.51

Farm Type E
Typical San Joaquin Valley 1990

Farm Revenues							
Yield cwt/Acre	45	50	55	60	65	70	75
Acreage	300	300	300	300	300	300	300
Price/cwt	$5.38	$5.38	$5.38	$5.38	$5.38	$5.38	$5.38
ASCS Payment/cwt	$2.13	$2.13	$2.13	$2.13	$2.13	$2.13	$2.13
Revenue/Acre	$338.10	$375.67	$413.23	$450.80	$488.37	$525.93	$563.50
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$170.27	$170.27	$170.27	$170.27	$170.27	$170.27	$170.27
Interest on Operating Capital	$9.30	$9.30	$9.30	$9.30	$9.30	$9.30	$9.30
Harvest Costs	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00
Post Harvest Costs							
Cash Overhead Costs	$61.51	$61.51	$61.51	$61.51	$61.51	$61.51	$61.51
Land Rent	$50.00	$50.00	$50.00	$50.00	$50.00	$50.00	$50.00
Total Cash Costs	$321.08	$321.08	$321.08	$321.08	$321.08	$321.08	$321.08
Total Cash Costs/cwt	$7.14	$6.42	$5.84	$5.35	$4.94	$4.59	$4.28
Depreciation							
Total Investment Costs	$24.61	$24.61	$24.61	$24.61	$24.61	$24.61	$24.61
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$170.27	$170.27	$170.27	$170.27	$170.27	$170.27	$170.27
Interest on Operating Capital	$9.30	$9.30	$9.30	$9.30	$9.30	$9.30	$9.30
Harvest Costs	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00
Post Harvest Costs							
Additional Post Harvest Costs (Incorporation)							
Increased Tilling	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Increased Fertilization	$7.50	$7.50	$7.50	$7.50	$7.50	$7.50	$7.50
Additional Post Harvest Costs (Removal)							
Collection Costs	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00
Transportation (3 tons/acre)	$25.20	$25.20	$25.20	$25.20	$25.20	$25.20	$25.20
Cash Overhead Costs	$61.51	$61.51	$61.51	$61.51	$61.51	$61.51	$61.51
Land Rent	$50.00	$50.00	$50.00	$50.00	$50.00	$50.00	$50.00
Total Cash Costs (Incorporation)	$337.58	$337.58	$337.58	$337.58	$337.58	$337.58	$337.58
Total Cash Costs/cwt (Incorporation)	$7.50	$6.75	$6.14	$5.63	$5.19	$4.82	$4.50
Total Cash Costs (Removal)	$366.28	$366.28	$366.28	$366.28	$366.28	$366.28	$366.28
Total Cash Costs/cwt (Removal)	$8.14	$7.33	$6.66	$6.10	$5.64	$5.23	$4.88
Depreciation							
Total Investment Costs	$24.61	$24.61	$24.61	$24.61	$24.61	$24.61	$24.61
Total Costs per acre (Burning)	$321.08	$321.08	$321.08	$321.08	$321.08	$321.08	$321.08
Total costs per cwt (Burning)	$7.14	$6.42	$5.84	$5.35	$4.94	$4.59	$4.28
Total Costs per acre (Incorporation)	$337.58	$337.58	$337.58	$337.58	$337.58	$337.58	$337.58
Total costs per cwt (Incorporation)	$7.50	$6.75	$6.14	$5.63	$5.19	$4.82	$4.50
Total Costs per acre (Removal)	$366.28	$366.28	$366.28	$366.28	$366.28	$366.28	$366.28
Total costs per cwt (Removal)	$8.14	$7.33	$6.66	$6.10	$5.64	$5.23	$4.88
Total Net Revenue (Burning)	$5,106.00	$16,376.00	$27,646.00	$38,916.00	$50,186.00	$61,456.00	$72,726.00
Total Net Revenue (Incorporation)	$156.00	$11,426.00	$22,696.00	$33,966.00	$45,236.00	$56,506.00	$67,776.00
Total Net Revenue (Removal)	($8,454.00)	$2,816.00	$14,086.00	$25,356.00	$36,626.00	$47,896.00	$59,166.00
Total Net Revenue/acre (Burning)	$17.02	$54.59	$92.15	$129.72	$167.29	$204.85	$242.42
Total Net Revenue/acre (Incorporatio	$0.52	$38.09	$75.65	$113.22	$150.79	$188.35	$225.92
Total Net Revenue/acre (Removal)	($28.18)	$9.39	$46.95	$84.52	$122.09	$159.65	$197.22
Net Revenue/cwt (Burning)	$0.38	$1.09	$1.68	$2.16	$2.57	$2.93	$3.23
Net Revenue/cwt (Incorporation)	$0.01	$0.76	$1.38	$1.89	$2.32	$2.69	$3.01
Net Revenue/cwt (Removal)	($0.63)	$0.19	$0.85	$1.41	$1.88	$2.28	$2.63

California Almonds
Farm Type A - Northern San Joaquin - Sprinkler

Yields and Revenues							
Yields/Acre (lbs)	1,250	1,500	1,750	2,000	2,250	2,500	2,750
Price/Lb	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
Revenue per Acre	$1,625.00	$1,950.00	$2,275.00	$2,600.00	$2,925.00	$3,250.00	$3,575.00
Production Costs							
Typical Acreage in Production	95	95	95	95	95	95	95
Total cultural costs	$900.11	$900.11	$900.11	$900.11	$900.11	$900.11	$900.11
Labor Costs (Included in Cultural Costs)	$241.67	$241.67	$241.67	$241.67	$241.67	$241.67	$241.67
Pruning							
Debris Disposal							
Labor costs							
Debris collection	$42.00	$42.00	$42.00	$42.00	$42.00	$42.00	$42.00
Burning	$1.67	$1.67	$1.67	$1.67	$1.67	$1.67	$1.67
Debris Disposal (Non-Burning)							
Residue Total Tons	95	95	95	95	95	95	95
Residue Tipping Costs (@$11/ton)	$11.00	$11.00	$11.00	$11.00	$11.00	$11.00	$11.00
Disposal Transportation Costs	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Harvest costs	$334.98	$334.98	$334.98	$334.98	$334.98	$334.98	$334.98
Interest on operating capital (@11%)	$46.52	$46.52	$46.52	$46.52	$46.52	$46.52	$46.52
Total Operating Cost (Burning)	$1,325.28	$1,325.28	$1,325.28	$1,325.28	$1,325.28	$1,325.28	$1,325.28
Total Operating Cost (Non-burning)	$1,342.81	$1,342.81	$1,342.81	$1,342.81	$1,342.81	$1,342.81	$1,342.81
Cash overhead	$199.63	$199.63	$199.63	$199.63	$199.63	$199.63	$199.63
Total Cash Costs (Burning)	$1,524.91	$1,524.91	$1,524.91	$1,524.91	$1,524.91	$1,524.91	$1,524.91
Total Cash Costs (Non-burning)	$1,542.44	$1,542.44	$1,542.44	$1,542.44	$1,542.44	$1,542.44	$1,542.44
Investment Costs							
Non-cash overhead	$221.60	$221.60	$221.60	$221.60	$221.60	$221.60	$221.60
Total Costs per acre (Burning)	$1,746.51	$1,746.51	$1,746.51	$1,746.51	$1,746.51	$1,746.51	$1,746.51
Total costs per pound (Burning)	$1.40	$1.16	$1.00	$0.87	$0.78	$0.70	$0.64
Total Costs per acre (Non-burning)	$1,764.04	$1,764.04	$1,764.04	$1,764.04	$1,764.04	$1,764.04	$1,764.04
Total costs per pound (Non-burning)	$1.41	$1.18	$1.01	$0.88	$0.78	$0.71	$0.64
Total Net Revenue (Burning)	($11,543.45)	$19,331.55	$50,206.55	$81,081.55	$111,956.55	$142,831.55	$173,706.55
Total Net Revenue (Non-burning)	($13,208.80)	$17,666.20	$48,541.20	$79,416.20	$110,291.20	$141,166.20	$172,041.20
Total Net Revenue/acre (Burning)	($121.51)	$203.49	$528.49	$853.49	$1,178.49	$1,503.49	$1,828.49
Total Net Revenue/acre (Non-burning)	($139.04)	$185.96	$510.96	$835.96	$1,160.96	$1,485.96	$1,810.96

California Almonds
Farm Type B - Northern San Joaquin - Flooded

Yields and Revenues							
Yields/Acre (lbs)	1,250	1,500	1,750	2,000	2,250	2,500	2,750
Price/Lb	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
Revenue per Acre	$1,625.00	$1,950.00	$2,275.00	$2,600.00	$2,925.00	$3,250.00	$3,575.00
Production Costs							
Typical Acreage in Production	95	95	95	95	95	95	95
Total cultural costs	$768.25	$768.25	$768.25	$768.25	$768.25	$768.25	$768.25
Labor Costs (Included in Cultural Costs)	$242.04	$242.04	$242.04	$242.04	$242.04	$242.04	$242.04
Pruning							
Debris Disposal							
Labor costs							
Debris collection	$42.00	$42.00	$42.00	$42.00	$42.00	$42.00	$42.00
Burning	$1.67	$1.67	$1.67	$1.67	$1.67	$1.67	$1.67
Debris Disposal (Non-Burning)							
Residue Total Tons	95	95	95	95	95	95	95
Residue Tipping Costs (@$11/ton)	$11.00	$11.00	$11.00	$11.00	$11.00	$11.00	$11.00
Disposal Transportation Costs	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Harvest costs	$334.98	$334.98	$334.98	$334.98	$334.98	$334.98	$334.98
Interest on operating capital (@11%)	$42.97	$42.97	$42.97	$42.97	$42.97	$42.97	$42.97
Total Operating Cost (Burning)	$1,189.87	$1,189.87	$1,189.87	$1,189.87	$1,189.87	$1,189.87	$1,189.87
Total Operating Cost (Non-burning)	$1,207.40	$1,207.40	$1,207.40	$1,207.40	$1,207.40	$1,207.40	$1,207.40
Cash overhead	$185.87	$185.87	$185.87	$185.87	$185.87	$185.87	$185.87
Total Cash Costs (Burning)	$1,375.74	$1,375.74	$1,375.74	$1,375.74	$1,375.74	$1,375.74	$1,375.74
Total Cash Costs (Non-burning)	$1,393.27	$1,393.27	$1,393.27	$1,393.27	$1,393.27	$1,393.27	$1,393.27
Investment Costs							
Non-cash overhead	$192.01	$192.01	$192.01	$192.01	$192.01	$192.01	$192.01
Total Costs per acre (Burning)	$1,567.75	$1,567.75	$1,567.75	$1,567.75	$1,567.75	$1,567.75	$1,567.75
Total costs per pound (Burning)	$1.25	$1.05	$0.90	$0.78	$0.70	$0.63	$0.57
Total Costs per acre (Non-burning)	$1,585.28	$1,585.28	$1,585.28	$1,585.28	$1,585.28	$1,585.28	$1,585.28
Total costs per pound (Non-burning)	$1.27	$1.06	$0.91	$0.79	$0.70	$0.63	$0.58
Total Net Revenue (Burning)	$5,438.75	$36,313.75	$67,188.75	$98,063.75	$128,938.75	$159,813.75	$190,688.75
Total Net Revenue (Non-burning)	$3,773.40	$34,648.40	$65,523.40	$96,398.40	$127,273.40	$158,148.40	$189,023.40
Total Net Revenue/acre (Burning)	$57.25	$382.25	$707.25	$1,032.25	$1,357.25	$1,682.25	$2,007.25
Total Net Revenue/acre (Non-burning)	$39.72	$364.72	$689.72	$1,014.72	$1,339.72	$1,664.72	$1,989.72

Farm Type C
Northern San Joaquin Valley - Early Leafing Lateral Bearing Walnuts

Farm Revenues							
Yield Tons/Acre	0.25	0.75	1.25	1.75	2.25	2.75	3.25
Acreage	60	60	60	60	60	60	60
Price/Ton	$1,040.00	$1,040.00	$1,040.00	$1,040.00	$1,040.00	$1,040.00	$1,040.00
Revenue/Acre	$260.00	$780.00	$1,300.00	$1,820.00	$2,340.00	$2,860.00	$3,380.00
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$451.00	$451.00	$451.00	$451.00	$451.00	$451.00	$451.00
Interest on Operating Capital (11%)	$35.00	$35.00	$35.00	$35.00	$35.00	$35.00	$35.00
Harvest Costs	$333.00	$333.00	$333.00	$333.00	$333.00	$333.00	$333.00
Cash Overhead Costs	$225.00	$225.00	$225.00	$225.00	$225.00	$225.00	$225.00
Total Cash Costs	$1,044.00	$1,044.00	$1,044.00	$1,044.00	$1,044.00	$1,044.00	$1,044.00
Total Cash Costs/Ton	$4,176.00	$1,392.00	$835.20	$596.57	$464.00	$379.64	$321.23
Depreciation							
Total Investment Costs	$1,598.00	$1,598.00	$1,598.00	$1,598.00	$1,598.00	$1,598.00	$1,598.00
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$451.00	$451.00	$451.00	$451.00	$451.00	$451.00	$451.00
Interest on Operating Capital (11%)	$35.00	$35.00	$35.00	$35.00	$35.00	$35.00	$35.00
Harvest Costs	$333.00	$333.00	$333.00	$333.00	$333.00	$333.00	$333.00
Residue Disposal							
Tipping Fee (@$9/ton)	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Transportation	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Cash Overhead Costs	$225.00	$225.00	$225.00	$225.00	$225.00	$225.00	$225.00
Total Cash Costs	$1,061.20	$1,061.20	$1,061.20	$1,061.20	$1,061.20	$1,061.20	$1,061.20
Total Cash Costs/Ton	$4,244.80	$1,414.93	$848.96	$606.40	$471.64	$385.89	$326.52
Depreciation							
Total Investment Costs	$1,598.00	$1,598.00	$1,598.00	$1,598.00	$1,598.00	$1,598.00	$1,598.00
Total Costs per acre (Burning)	$1,044.00	$1,044.00	$1,044.00	$1,044.00	$1,044.00	$1,044.00	$1,044.00
Total costs per Ton (Burning)	$4,176.00	$1,392.00	$835.20	$596.57	$464.00	$379.64	$321.23
Total Costs per acre (Non-burning)	$1,061.20	$1,061.20	$1,061.20	$1,061.20	$1,061.20	$1,061.20	$1,061.20
Total costs per Ton (Non-burning)	$4,244.80	$1,414.93	$848.96	$606.40	$471.64	$385.89	$326.52
Total Net Revenue (Burning)	($47,040.00)	($15,840.00)	$15,360.00	$46,560.00	$77,760.00	$108,960.00	$140,160.00
Total Net Revenue (Non-burning)	($48,072.00)	($16,872.00)	$14,328.00	$45,528.00	$76,728.00	$107,928.00	$139,128.00
Total Net Revenue/acre (Burning)	($784.00)	($264.00)	$256.00	$776.00	$1,296.00	$1,816.00	$2,336.00
Total Net Revenue/acre (Non-burning)	($801.20)	($281.20)	$238.80	$758.80	$1,278.80	$1,798.80	$2,318.80

Farm Type D
Northern San Joaquin Valley - Hedgerow Walnuts

Farm Revenues							
Yield Tons/Acre	2.625	2.75	2.875	3	3.125	3.25	3.375
Acreage	20	20	20	20	20	20	20
Price/Ton	$1,040.00	$1,040.00	$1,040.00	$1,040.00	$1,040.00	$1,040.00	$1,040.00
Revenue/Acre	$2,730.00	$2,860.00	$2,990.00	$3,120.00	$3,250.00	$3,380.00	$3,510.00
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$550.00	$550.00	$550.00	$550.00	$550.00	$550.00	$550.00
Interest on Operating Capital (11%)	$44.00	$44.00	$44.00	$44.00	$44.00	$44.00	$44.00
Harvest Costs	$570.00	$570.00	$570.00	$570.00	$570.00	$570.00	$570.00
Cash Overhead Costs	$171.00	$171.00	$171.00	$171.00	$171.00	$171.00	$171.00
Total Cash Costs	$1,335.00	$1,335.00	$1,335.00	$1,335.00	$1,335.00	$1,335.00	$1,335.00
Total Cash Costs/Ton	$508.57	$485.45	$464.35	$445.00	$427.20	$410.77	$395.56
Depreciation							
Total Investment Costs	$1,469.00	$1,469.00	$1,469.00	$1,469.00	$1,469.00	$1,469.00	$1,469.00
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$550.00	$550.00	$550.00	$550.00	$550.00	$550.00	$550.00
Interest on Operating Capital (11%)	$44.00	$44.00	$44.00	$44.00	$44.00	$44.00	$44.00
Harvest Costs	$570.00	$570.00	$570.00	$570.00	$570.00	$570.00	$570.00
Residue Disposal							
Tipping Fee (@$9/ton)	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Transportation	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Cash Overhead Costs	$171.00	$171.00	$171.00	$171.00	$171.00	$171.00	$171.00
Total Cash Costs	$1,352.20	$1,352.20	$1,352.20	$1,352.20	$1,352.20	$1,352.20	$1,352.20
Total Cash Costs/Ton	$515.12	$491.71	$470.33	$450.73	$432.70	$416.06	$400.65
Depreciation							
Total Investment Costs	$1,469.00	$1,469.00	$1,469.00	$1,469.00	$1,469.00	$1,469.00	$1,469.00
Total Costs per acre (Burning)	$1,335.00	$1,335.00	$1,335.00	$1,335.00	$1,335.00	$1,335.00	$1,335.00
Total costs per Ton (Burning)	$508.57	$485.45	$464.35	$445.00	$427.20	$410.77	$395.56
Total Costs per acre (Non-burning)	$1,352.20	$1,352.20	$1,352.20	$1,352.20	$1,352.20	$1,352.20	$1,352.20
Total costs per Ton (Non-burning)	$515.12	$491.71	$470.33	$450.73	$432.70	$416.06	$400.65
Total Net Revenue (Burning)	$27,900.00	$30,500.00	$33,100.00	$35,700.00	$38,300.00	$40,900.00	$43,500.00
Total Net Revenue (Non-burning)	$27,556.00	$30,156.00	$32,756.00	$35,356.00	$37,956.00	$40,556.00	$43,156.00
Total Net Revenue/acre (Burning)	$1,395.00	$1,525.00	$1,655.00	$1,785.00	$1,915.00	$2,045.00	$2,175.00
Total Net Revenue/acre (Non-burning)	$1,377.80	$1,507.80	$1,637.80	$1,767.80	$1,897.80	$2,027.80	$2,157.80

Farm Type A
Sacramento Valley - Lateral Bearing Walnuts

Farm Revenues							
Yield Tons/Acre	1.625	1.75	1.875	2	2.125	2.25	2.375
Acreage	105	105	105	105	105	105	105
Price/Ton	$822.00	$822.00	$822.00	$822.00	$822.00	$822.00	$822.00
Revenue/Acre	$1,335.75	$1,438.50	$1,541.25	$1,644.00	$1,746.75	$1,849.50	$1,952.25
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$522.00	$522.00	$522.00	$522.00	$522.00	$522.00	$522.00
Interest on Operating Capital (11%)	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00
Harvest Costs	$297.00	$297.00	$297.00	$297.00	$297.00	$297.00	$297.00
Cash Overhead Costs	$110.00	$110.00	$110.00	$110.00	$110.00	$110.00	$110.00
Total Cash Costs	$956.00	$956.00	$956.00	$956.00	$956.00	$956.00	$956.00
Total Cash Costs/Ton	$588.31	$546.29	$509.87	$478.00	$449.88	$424.89	$402.53
Depreciation							
Total Investment Costs	$701.00	$701.00	$701.00	$701.00	$701.00	$701.00	$701.00
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$522.00	$522.00	$522.00	$522.00	$522.00	$522.00	$522.00
Interest on Operating Capital (11%)	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00
Harvest Costs	$297.00	$297.00	$297.00	$297.00	$297.00	$297.00	$297.00
Residue Disposal							
Tipping Fee (@$9/ton)	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Transportation	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Cash Overhead Costs	$110.00	$110.00	$110.00	$110.00	$110.00	$110.00	$110.00
Total Cash Costs	$973.20	$973.20	$973.20	$973.20	$973.20	$973.20	$973.20
Total Cash Costs/Ton	$598.89	$556.11	$519.04	$486.60	$457.98	$432.53	$409.77
Depreciation							
Total Investment Costs	$701.00	$701.00	$701.00	$701.00	$701.00	$701.00	$701.00
Total Costs per acre (Burning)	$956.00	$956.00	$956.00	$956.00	$956.00	$956.00	$956.00
Total costs per Ton (Burning)	$588.31	$546.29	$509.87	$478.00	$449.88	$424.89	$402.53
Total Costs per acre (Non-burning)	$973.20	$973.20	$973.20	$973.20	$973.20	$973.20	$973.20
Total costs per Ton (Non-burning)	$598.89	$556.11	$519.04	$486.60	$457.98	$432.53	$409.77
Total Net Revenue (Burning)	$39,873.75	$50,662.50	$61,451.25	$72,240.00	$83,028.75	$93,817.50	$104,606.25
Total Net Revenue (Non-burning)	$38,067.75	$48,856.50	$59,645.25	$70,434.00	$81,222.75	$92,011.50	$102,800.25
Total Net Revenue/acre (Burning)	$379.75	$482.50	$585.25	$688.00	$790.75	$893.50	$996.25
Total Net Revenue/acre (Non-burning)	$362.55	$465.30	$568.05	$670.80	$773.55	$876.30	$979.05

Farm Type B
Sacramento Valley - Hartley Walnuts

Farm Revenues							
Yield Tons/Acre	1.625	1.75	1.875	2	2.125	2.25	2.375
Acreage	105	105	105	105	105	105	105
Price/Ton	$822.00	$822.00	$822.00	$822.00	$822.00	$822.00	$822.00
Revenue/Acre	$1,335.75	$1,438.50	$1,541.25	$1,644.00	$1,746.75	$1,849.50	$1,952.25
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$357.00	$357.00	$357.00	$357.00	$357.00	$357.00	$357.00
Interest on Operating Capital (11%)	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00
Harvest Costs	$287.00	$287.00	$287.00	$287.00	$287.00	$287.00	$287.00
Cash Overhead Costs	$110.00	$110.00	$110.00	$110.00	$110.00	$110.00	$110.00
Total Cash Costs	$774.00	$774.00	$774.00	$774.00	$774.00	$774.00	$774.00
Total Cash Costs/Ton	$476.31	$442.29	$412.80	$387.00	$364.24	$344.00	$325.89
Depreciation							
Total Investment Costs	$701.00	$701.00	$701.00	$701.00	$701.00	$701.00	$701.00
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$357.00	$357.00	$357.00	$357.00	$357.00	$357.00	$357.00
Interest on Operating Capital (11%)	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00
Harvest Costs	$287.00	$287.00	$287.00	$287.00	$287.00	$287.00	$287.00
Residue Disposal							
Tipping Fee (@$9/ton)	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Transportation	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Cash Overhead Costs	$110.00	$110.00	$110.00	$110.00	$110.00	$110.00	$110.00
Total Cash Costs	$791.20	$791.20	$791.20	$791.20	$791.20	$791.20	$791.20
Total Cash Costs/Ton	$486.89	$452.11	$421.97	$395.60	$372.33	$351.64	$333.14
Depreciation							
Total Investment Costs	$701.00	$701.00	$701.00	$701.00	$701.00	$701.00	$701.00
Total Costs per acre (Burning)	$774.00	$774.00	$774.00	$774.00	$774.00	$774.00	$774.00
Total costs per Ton (Burning)	$476.31	$442.29	$412.80	$387.00	$364.24	$344.00	$325.89
Total Costs per acre (Non-burning)	$791.20	$791.20	$791.20	$791.20	$791.20	$791.20	$791.20
Total costs per Ton (Non-burning)	$486.89	$452.11	$421.97	$395.60	$372.33	$351.64	$333.14
Total Net Revenue (Burning)	$58,983.75	$69,772.50	$80,561.25	$91,350.00	$102,138.75	$112,927.50	$123,716.25
Total Net Revenue (Non-burning)	$57,177.75	$67,966.50	$78,755.25	$89,544.00	$100,332.75	$111,121.50	$121,910.25
Total Net Revenue/acre (Burning)	$561.75	$664.50	$767.25	$870.00	$972.75	$1,075.50	$1,178.25
Total Net Revenue/acre (Non-burning)	$544.55	$647.30	$750.05	$852.80	$955.55	$1,058.30	$1,161.05

Farm Type E
Northern San Joaquin Valley - Late Leafing Lateral Bearing Walnuts

Farm Revenues							
Yield Tons/Acre	0.25	0.75	1.25	1.75	2.25	2.75	3.25
Acreage	60	60	60	60	60	60	60
Price/Ton	$1,040.00	$1,040.00	$1,040.00	$1,040.00	$1,040.00	$1,040.00	$1,040.00
Revenue/Acre	$260.00	$780.00	$1,300.00	$1,820.00	$2,340.00	$2,860.00	$3,380.00
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$295.00	$295.00	$295.00	$295.00	$295.00	$295.00	$295.00
Interest on Operating Capital (11%)	$24.00	$24.00	$24.00	$24.00	$24.00	$24.00	$24.00
Harvest Costs	$333.00	$333.00	$333.00	$333.00	$333.00	$333.00	$333.00
Cash Overhead Costs	$224.00	$224.00	$224.00	$224.00	$224.00	$224.00	$224.00
Total Cash Costs	$876.00	$876.00	$876.00	$876.00	$876.00	$876.00	$876.00
Total Cash Costs/Ton	$3,504.00	$1,168.00	$700.80	$500.57	$389.33	$318.55	$269.54
Depreciation							
Total Investment Costs	$1,592.00	$1,592.00	$1,592.00	$1,592.00	$1,592.00	$1,592.00	$1,592.00
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$295.00	$295.00	$295.00	$295.00	$295.00	$295.00	$295.00
Interest on Operating Capital (11%)	$24.00	$24.00	$24.00	$24.00	$24.00	$24.00	$24.00
Harvest Costs	$333.00	$333.00	$333.00	$333.00	$333.00	$333.00	$333.00
Residue Disposal							
Tipping Fee (@$9/ton)	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Transportation	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Cash Overhead Costs	$224.00	$224.00	$224.00	$224.00	$224.00	$224.00	$224.00
Total Cash Costs	$893.20	$893.20	$893.20	$893.20	$893.20	$893.20	$893.20
Total Cash Costs/Ton	$3,572.80	$1,190.93	$714.56	$510.40	$396.98	$324.80	$274.83
Depreciation							
Total Investment Costs	$1,592.00	$1,592.00	$1,592.00	$1,592.00	$1,592.00	$1,592.00	$1,592.00
Total Costs per acre (Burning)	$876.00	$876.00	$876.00	$876.00	$876.00	$876.00	$876.00
Total costs per Ton (Burning)	$3,504.00	$1,168.00	$700.80	$500.57	$389.33	$318.55	$269.54
Total Costs per acre (Non-burning)	$893.20	$893.20	$893.20	$893.20	$893.20	$893.20	$893.20
Total costs per Ton (Non-burning)	$3,572.80	$1,190.93	$714.56	$510.40	$396.98	$324.80	$274.83
Total Net Revenue (Burning)	($36,960.00)	($5,760.00)	$25,440.00	$56,640.00	$87,840.00	$119,040.00	$150,240.00
Total Net Revenue (Non-burning)	($37,992.00)	($6,792.00)	$24,408.00	$55,608.00	$86,808.00	$118,008.00	$149,208.00
Total Net Revenue/acre (Burning)	($616.00)	($96.00)	$424.00	$944.00	$1,464.00	$1,984.00	$2,504.00
Total Net Revenue/acre (Non-burning)	($633.20)	($113.20)	$406.80	$926.80	$1,446.80	$1,966.80	$2,486.80

Farm Type F
Merced County - Walnuts

Farm Revenues							
Yield Tons/Acre	0.25	0.75	1.25	1.75	2.25	2.75	3.25
Acreage							
Price/Ton	$1,080.00	$1,080.00	$1,080.00	$1,080.00	$1,080.00	$1,080.00	$1,080.00
Revenue/Acre	$270.00	$810.00	$1,350.00	$1,890.00	$2,430.00	$2,970.00	$3,510.00
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$890.00	$890.00	$890.00	$890.00	$890.00	$890.00	$890.00
Interest on Operating Capital (11%)	$46.00	$46.00	$46.00	$46.00	$46.00	$46.00	$46.00
Harvest Costs	$328.00	$328.00	$328.00	$328.00	$328.00	$328.00	$328.00
Cash Overhead Costs							
Total Cash Costs	$1,264.00	$1,264.00	$1,264.00	$1,264.00	$1,264.00	$1,264.00	$1,264.00
Total Cash Costs/Ton	$5,056.00	$1,685.33	$1,011.20	$722.29	$561.78	$459.64	$388.92
Depreciation	$527.00	$527.00	$527.00	$527.00	$527.00	$527.00	$527.00
Total Investment Costs	$550.00	$550.00	$550.00	$550.00	$550.00	$550.00	$550.00
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$890.00	$890.00	$890.00	$890.00	$890.00	$890.00	$890.00
Interest on Operating Capital (11%)	$46.00	$46.00	$46.00	$46.00	$46.00	$46.00	$46.00
Harvest Costs	$328.00	$328.00	$328.00	$328.00	$328.00	$328.00	$328.00
Residue Disposal							
Tipping Fee (@$9/ton)	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Transportation	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Cash Overhead Costs							
Total Cash Costs	$1,281.20	$1,281.20	$1,281.20	$1,281.20	$1,281.20	$1,281.20	$1,281.20
Total Cash Costs/Ton	$5,124.80	$1,708.27	$1,024.96	$732.11	$569.42	$465.89	$394.22
Depreciation	$527.00	$527.00	$527.00	$527.00	$527.00	$527.00	$527.00
Total Investment Costs	$550.00	$550.00	$550.00	$550.00	$550.00	$550.00	$550.00
Total Costs per acre (Burning)	$1,264.00	$1,264.00	$1,264.00	$1,264.00	$1,264.00	$1,264.00	$1,264.00
Total costs per Ton (Burning)	$5,056.00	$1,685.33	$1,011.20	$722.29	$561.78	$459.64	$388.92
Total Costs per acre (Non-burning)	$1,281.20	$1,281.20	$1,281.20	$1,281.20	$1,281.20	$1,281.20	$1,281.20
Total costs per Ton (Non-burning)	$5,124.80	$1,708.27	$1,024.96	$732.11	$569.42	$465.89	$394.22
Total Net Revenue (Burning)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Net Revenue (Non-burning)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Net Revenue/acre (Burning)	($994.00)	($454.00)	$86.00	$626.00	$1,166.00	$1,706.00	$2,246.00
Total Net Revenue/acre (Non-burning)	($1,011.20)	($471.20)	$68.80	$608.80	$1,148.80	$1,688.80	$2,228.80

Farm Type G
Southern San Joaquin Valley - Early Leafing Lateral Bearing Walnuts

Farm Revenues							
Yield Tons/Acre	0.25	0.75	1.25	1.75	2.25	2.75	3.25
Acreage	57	57	57	57	57	57	57
Price/Ton	$1,070.00	$1,070.00	$1,070.00	$1,070.00	$1,070.00	$1,070.00	$1,070.00
Revenue/Acre	$267.50	$802.50	$1,337.50	$1,872.50	$2,407.50	$2,942.50	$3,477.50
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$648.00	$648.00	$648.00	$648.00	$648.00	$648.00	$648.00
Interest on Operating Capital (11%)	$41.00	$41.00	$41.00	$41.00	$41.00	$41.00	$41.00
Harvest Costs	$393.00	$393.00	$393.00	$393.00	$393.00	$393.00	$393.00
Cash Overhead Costs	$198.00	$198.00	$198.00	$198.00	$198.00	$198.00	$198.00
Total Cash Costs	$1,280.00	$1,280.00	$1,280.00	$1,280.00	$1,280.00	$1,280.00	$1,280.00
Total Cash Costs/Ton	$5,120.00	$1,706.67	$1,024.00	$731.43	$568.89	$465.45	$393.85
Depreciation							
Total Investment Costs	$1,707.00	$1,707.00	$1,707.00	$1,707.00	$1,707.00	$1,707.00	$1,707.00
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$648.00	$648.00	$648.00	$648.00	$648.00	$648.00	$648.00
Interest on Operating Capital (11%)	$41.00	$41.00	$41.00	$41.00	$41.00	$41.00	$41.00
Harvest Costs	$393.00	$393.00	$393.00	$393.00	$393.00	$393.00	$393.00
Residue Disposal							
Tipping Fee (@$9/ton)	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Transportation	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Cash Overhead Costs	$198.00	$198.00	$198.00	$198.00	$198.00	$198.00	$198.00
Total Cash Costs	$1,297.20	$1,297.20	$1,297.20	$1,297.20	$1,297.20	$1,297.20	$1,297.20
Total Cash Costs/Ton	$5,188.80	$1,729.60	$1,037.76	$741.26	$576.53	$471.71	$399.14
Depreciation							
Total Investment Costs	$1,707.00	$1,707.00	$1,707.00	$1,707.00	$1,707.00	$1,707.00	$1,707.00
Total Costs per acre (Burning)	$1,280.00	$1,280.00	$1,280.00	$1,280.00	$1,280.00	$1,280.00	$1,280.00
Total costs per Ton (Burning)	$5,120.00	$1,706.67	$1,024.00	$731.43	$568.89	$465.45	$393.85
Total Costs per acre (Non-burning)	$1,297.20	$1,297.20	$1,297.20	$1,297.20	$1,297.20	$1,297.20	$1,297.20
Total costs per Ton (Non-burning)	$5,188.80	$1,729.60	$1,037.76	$741.26	$576.53	$471.71	$399.14
Total Net Revenue (Burning)	($57,712.50)	($27,217.50)	$3,277.50	$33,772.50	$64,267.50	$94,762.50	$125,257.50
Total Net Revenue (Non-burning)	($58,692.90)	($28,197.90)	$2,297.10	$32,792.10	$63,287.10	$93,782.10	$124,277.10
Total Net Revenue/acre (Burning)	($1,012.50)	($477.50)	$57.50	$592.50	$1,127.50	$1,662.50	$2,197.50
Total Net Revenue/acre (Non-burning)	($1,029.70)	($494.70)	$40.30	$575.30	$1,110.30	$1,645.30	$2,180.30

Farm Type H
Southern San Joaquin Valley - Late Leafing Lateral Bearing Walnuts

arm Revenues							
ield Tons/Acre	0.25	0.75	1.25	1.75	2.25	2.75	3.25
creage	57	57	57	57	57	57	57
ice/Ton	$1,070.00	$1,070.00	$1,070.00	$1,070.00	$1,070.00	$1,070.00	$1,070.00
evenue/Acre	$267.50	$802.50	$1,337.50	$1,872.50	$2,407.50	$2,942.50	$3,477.50
roduction Costs with Residue Burning							
ultural Costs							
Costs Excluding Interest	$505.00	$505.00	$505.00	$505.00	$505.00	$505.00	$505.00
Interest on Operating Capital (11%)	$45.00	$45.00	$45.00	$45.00	$45.00	$45.00	$45.00
arvest Costs	$393.00	$393.00	$393.00	$393.00	$393.00	$393.00	$393.00
ash Overhead Costs	$213.00	$213.00	$213.00	$213.00	$213.00	$213.00	$213.00
otal Cash Costs	$1,156.00	$1,156.00	$1,156.00	$1,156.00	$1,156.00	$1,156.00	$1,156.00
otal Cash Costs/Ton	$4,624.00	$1,541.33	$924.80	$660.57	$513.78	$420.36	$355.69
epreciation							
otal Investment Costs	$1,673.00	$1,673.00	$1,673.00	$1,673.00	$1,673.00	$1,673.00	$1,673.00
roduction Costs with Non-burn Alternatives							
ultural Costs							
Costs Excluding Interest	$505.00	$505.00	$505.00	$505.00	$505.00	$505.00	$505.00
Interest on Operating Capital (11%)	$45.00	$45.00	$45.00	$45.00	$45.00	$45.00	$45.00
arvest Costs	$393.00	$393.00	$393.00	$393.00	$393.00	$393.00	$393.00
esidue Disposal							
Tipping Fee (@$9/ton)	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Transportation	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
ash Overhead Costs	$213.00	$213.00	$213.00	$213.00	$213.00	$213.00	$213.00
otal Cash Costs	$1,173.20	$1,173.20	$1,173.20	$1,173.20	$1,173.20	$1,173.20	$1,173.20
otal Cash Costs/Ton	$4,692.80	$1,564.27	$938.56	$670.40	$521.42	$426.62	$360.98
epreciation							
otal Investment Costs	$1,673.00	$1,673.00	$1,673.00	$1,673.00	$1,673.00	$1,673.00	$1,673.00
Total Costs per acre (Burning)	$1,156.00	$1,156.00	$1,156.00	$1,156.00	$1,156.00	$1,156.00	$1,156.00
Total costs per Ton (Burning)	$4,624.00	$1,541.33	$924.80	$660.57	$513.78	$420.36	$355.69
Total Costs per acre (Non-burning)	$1,173.20	$1,173.20	$1,173.20	$1,173.20	$1,173.20	$1,173.20	$1,173.20
Total costs per Ton (Non-burning)	$4,692.80	$1,564.27	$938.56	$670.40	$521.42	$426.62	$360.98
Total Net Revenue (Burning)	($50,644.50)	($20,149.50)	$10,345.50	$40,840.50	$71,335.50	$101,830.50	$132,325.50
Total Net Revenue (Non-burning)	($51,624.90)	($21,129.90)	$9,365.10	$39,860.10	$70,355.10	$100,850.10	$131,345.10
Total Net Revenue/acre (Burning)	($888.50)	($353.50)	$181.50	$716.50	$1,251.50	$1,786.50	$2,321.50
Total Net Revenue/acre (Non-burning)	($905.70)	($370.70)	$164.30	$699.30	$1,234.30	$1,769.30	$2,304.30

Farm Type I
Southern San Joaquin Valley - Late Leafing Terminal Bearing Walnuts

Farm Revenues							
Yield Tons/Acre	0.25	0.75	1.25	1.75	2.25	2.75	3.25
Acreage	57	57	57	57	57	57	57
Price/Ton	$1,070.00	$1,070.00	$1,070.00	$1,070.00	$1,070.00	$1,070.00	$1,070.00
Revenue/Acre	$267.50	$802.50	$1,337.50	$1,872.50	$2,407.50	$2,942.50	$3,477.50
Production Costs with Residue Burning							
Cultural Costs							
Costs Excluding Interest	$427.00	$427.00	$427.00	$427.00	$427.00	$427.00	$427.00
Interest on Operating Capital (11%)	$31.00	$31.00	$31.00	$31.00	$31.00	$31.00	$31.00
Harvest Costs	$393.00	$393.00	$393.00	$393.00	$393.00	$393.00	$393.00
Cash Overhead Costs	$179.00	$179.00	$179.00	$179.00	$179.00	$179.00	$179.00
Total Cash Costs	$1,030.00	$1,030.00	$1,030.00	$1,030.00	$1,030.00	$1,030.00	$1,030.00
Total Cash Costs/Ton	$4,120.00	$1,373.33	$824.00	$588.57	$457.78	$374.55	$316.92
Depreciation							
Total Investment Costs	$1,883.00	$1,883.00	$1,883.00	$1,883.00	$1,883.00	$1,883.00	$1,883.00
Production Costs with Non-burn Alternatives							
Cultural Costs							
Costs Excluding Interest	$427.00	$427.00	$427.00	$427.00	$427.00	$427.00	$427.00
Interest on Operating Capital (11%)	$31.00	$31.00	$31.00	$31.00	$31.00	$31.00	$31.00
Harvest Costs	$393.00	$393.00	$393.00	$393.00	$393.00	$393.00	$393.00
Residue Disposal							
Tipping Fee (@$9/ton)	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Transportation	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20	$8.20
Cash Overhead Costs	$179.00	$179.00	$179.00	$179.00	$179.00	$179.00	$179.00
Total Cash Costs	$1,047.20	$1,047.20	$1,047.20	$1,047.20	$1,047.20	$1,047.20	$1,047.20
Total Cash Costs/Ton	$4,188.80	$1,396.27	$837.76	$598.40	$465.42	$380.80	$322.22
Depreciation							
Total Investment Costs	$1,883.00	$1,883.00	$1,883.00	$1,883.00	$1,883.00	$1,883.00	$1,883.00
Total Costs per acre (Burning)	$1,030.00	$1,030.00	$1,030.00	$1,030.00	$1,030.00	$1,030.00	$1,030.00
Total costs per Ton (Burning)	$4,120.00	$1,373.33	$824.00	$588.57	$457.78	$374.55	$316.92
Total Costs per acre (Non-burning)	$1,047.20	$1,047.20	$1,047.20	$1,047.20	$1,047.20	$1,047.20	$1,047.20
Total costs per Ton (Non-burning)	$4,188.80	$1,396.27	$837.76	$598.40	$465.42	$380.80	$322.22
Total Net Revenue (Burning)	($43,462.50)	($12,967.50)	$17,527.50	$48,022.50	$78,517.50	$109,012.50	$139,507.50
Total Net Revenue (Non-burning)	($44,442.90)	($13,947.90)	$16,547.10	$47,042.10	$77,537.10	$108,032.10	$138,527.10
Total Net Revenue/acre (Burning)	($762.50)	($227.50)	$307.50	$842.50	$1,377.50	$1,912.50	$2,447.50
Total Net Revenue/acre (Non-burning)	($779.70)	($244.70)	$290.30	$825.30	$1,360.30	$1,895.30	$2,430.30

Appendix C

A Computable General Equilibrium Model for Sacramento Valley

Appendix C

A Computable General Equilibrium Model for the Sacramento Valley

Regional economic adjustment to the phase-down of rice straw residue burning was estimated with a modified computable general equilibrium (CGE) model. The model is a variant of a model used by Berk, Robinson, and Goldman to estimate economic adjustments to water supply reductions within the San Joaquin Valley (Berck, Robinson, & Goldman, 1991), and more generally of a class of models used to analyze response to national agricultural policy (Adelman & Robinson, 1986; Sherony, Knowles, & Boyd, 1991). This appendix provides a description of the Sacramento Valley CGE model (SVCGEM) structure, data sets, and assumptions.

CGE Model Structure

A CGE model is a mathematical programming description of a text book economy. It includes utility maximizing consumers, whose decisions determine the demand for goods and supplies of labor in the region; profit maximizing producers, whose decisions determine the supply of goods and the demand for primary factors (i.e., labor, capital, land) in the region; and government, which collects taxes and provides transfers, subsidies, and services within the region. It accounts for interregional trade flows and specifies production technology and market-clearing conditions to determine relative prices, sectoral factor demand and output, value-added, government receipts, and household income for the regional economy (Dervis, Melo, & Robinson, 1982).

The SVCGEM is a "small" region model, covering the eight rice producing counties of the Sacramento Valley.[1] Small region CGE models differ from large region or national models in several ways. First, the majority of sectoral exports will face perfectly elastic demands at fixed prices because the limited production capability of a small region will prevent it from having a price varying influence on the total market for a good. Second, all imports are "noncomparable", which means that the region does not produce these goods or services but it does use them in direct consumption or as intermediate inputs to production.[2] The SVCGEM fixes imports at base year levels and solves for exports by clearing the region's product markets. Net exports are then determined residually to balance supply with demand.[3] Third, the exchange rate is fixed and set to one since the region conducts its trade within the borders of the national economy. Fourth, sectoral capital is fixed and immobile. Labor supply also is assumed to be fixed, and the model solves for the market clearing wage.[4]

SVCGEM Sectors and SAM

The SVCGEM has 14 sectors (listed in Table C-1), with 6 agricultural sectors (food grains, feed grains, fruits and vegetables, livestock, dairy, and other agriculture), 2 processing sectors (agricultural processing and dairy processing), 1 "other" manufacturing sector, a mining sector, and 4 service sectors (freight, trade, FIRE[5], and other). Each of these sectors is a composite of sectors included in the U.S. Forest Service's 528 sector IMPLAN input-output model.

---

[1]These counties are: Butte, Colusa, Glenn, Placer, Sacramento, Sutter, Yolo, and Yuba.

[2]In large region CGE models, import s are typically modeled as imperfect substitutes to local production.

[3]A negative net export implies an increase in regional imports. So holding imports constant to solve the model does not preclude the model solving for an increase in regional imports.

[4]Alternatively, the model could specify a fixed wage and solve for the equilibrium employment level. Model results are not altered by choice of specification in this excercise because the policies under consideration have minimal impact on the region's labor market.

[5]FIRE: Finance, Insurance, and Realestate.

Table C-1
Butte, Colusa, Glenn, Placer,
Sacramento, Yolo, and Yuba Counties

Sector No.	Sector Description
1	Dairy Farm Products
2	Livestock
11	Food Grains
12	Feed Grains and Hay & Pasture
16	Fruits, Nuts, and Vegetables
19	Other Agriculture
32	Mining
82	Agri Manufacturing
87	Dairy Manufacturing
131	Other Manufacturing
446	Freight / Transportation
460	Trade
464	Banking/Insurance/Real Estate
66	All Others

To trace regional income flows, the model also includes 3 household types (low, medium, and high), three factors of production (land, labor, and capital), a trade sector (to capture net export flows) and three income distributing institutions (labor, capital, and government). The Social Accounting Matrix (SAM) shown in Table C-2 provides the data used to model the income flows between these agents. In Table C-2, row entries represent receipts and column entries represent expenditures. For example, column 1 shows that payments to labor (agent 2) by industries (agent 1) total $14.94 billion (1985 dollars). Labor, in turn, distributes these wage receipts to low, medium, and high income households (agents 5-7) in the form of wage income, and to the government (agent 8) in the form of social security taxes.

Column and row 1 in Table C-2 represent aggregate industry transactions for the 14 industrial sectors in the model. Tables C-3 to C-5 break out these transactions by sector, giving a more detailed view of industrial activity in the region.

Table C-3 shows inter-industry transactions for the region. Using the food grain sector (sector 11 in the tables) as an example, the table shows industry purchases of $89.5 million in goods and services from other industries in the region (primarily FIRE, Trade, Other Ag, and All Others). It receives from these industries $27.2 million, primarily from Agricultural Processing.

Table C-4 breaks out final payments to factors, trade, and intermediate purchases for the 14 industrial sectors. For instance, the food grain sector pays $22.7 million to labor, $4.8 million for indirect taxes, and $98.1 in proprietor and property income, and it imports $81.7 million in goods and services. Total industrial outlays, including intermediate purchases from Table C-3, equal $234.5 million.

Table C-5 breaks out final consumption demand for each sector. It shows receipts from households, government, investment, trade, and intermediate purchases. For instance, this table shows that the food grain sector is an export driven industry, with receipts from exports accounting for 90 percent of industry output.

The CVCGEM uses the data in tables C-2 to C-5 to calculate parameters for household, government, investment, and trade expenditure shares; factor income shares; intermediate input sectoral demands; household and business tax rates; and government income transfer shares. The resultant parameter estimates calibrate the model so that it can replicate base year income flows.

Table C-2
Butte, Colusa, Glenn, Placer, Sacramento, Sutter, Yolo, Yuba

1982 Social Accounting Matrix updated to 1985.
($MM 1985)

AGENT	Industries 1	income 2	Profits 3	Enterprises 4	(Low income) 5	income) 6	(High income) 7	Government 8	Invest 9	World 10	Total 11
1	8001	0	0	0	2676	4495	3727	3656	3190	10827	36571
2	14941	0	0	0	0	0	0	0	0	0	14941
3	5367	0	0	0	0	0	0	0	0	0	5367
4	0	0	4361	0	0	0	0	0	0	0	4361
5	0	820	0	487	0	0	0	2403	0	0	3709
6	0	7565	0	2191	0	0	0	800	0	0	10557
7	0	4345	0	2089	0	0	0	383	0	0	6817
8	1673	2480	0	-603	269	2481	852	0	0	0	7153
9	0	0	1006	196	-331	-120	-387	-1092	0	7477	6749
10	6589	-268	0	0	1095	3700	2626	1003	3559	0	18304
11	36571	14941	5367	4361	3709	10557	6817	7153	6749	18304	

Source: IMPLAN

Table C-3
Butte, Colusa, Glenn, Placer, Sacramento, Sutter, Yolo, and Yuba Counties

INTERINDUSTRY TRANSACTIONS
(Millions of 1985 Dollars)

Industry	1	2	11	12	16	19	32	82
1	0.0239	0.3881	0.1571	0.1543	0.5059	0.0567	0.0000	0.0000
2	0.0940	36.0423	4.8491	1.4312	3.0229	2.2731	0.0000	22.3536
11	0.1446	1.7310	1.9389	0.1371	2.8492	0.3282	0.0004	19.6509
12	0.8980	2.8596	0.1045	0.0732	0.3889	0.0454	0.0000	0.0541
16	0.2419	2.9074	1.3510	0.2409	5.5913	0.5743	0.0000	28.1363
19	1.1482	13.7189	6.4133	1.2279	27.8010	4.8814	0.0077	24.1949
32	0.0066	0.0341	0.1713	0.0386	0.1846	0.0544	2.4317	0.1006
82	0.2174	1.3136	0.2027	0.0675	0.1178	0.2297	0.0091	51.0709
87	0.0028	0.0148	0.0004	0.0002	0.0003	0.0020	0.0017	12.4100
131	0.5392	2.1774	3.6016	0.9410	7.6214	3.0589	0.7595	80.7627
446	2.4887	6.0003	3.9070	1.1602	4.7852	4.5584	0.6895	53.1752
460	2.2005	14.2303	12.9922	4.0145	17.3172	16.8246	1.8005	144.3110
464	3.2969	12.7781	40.8062	8.2485	20.1570	12.1353	10.4956	23.4028
66	1.7911	9.9469	13.0108	4.0556	15.8597	19.7969	9.7750	129.9423
Column Total	13.0937	104.1427	89.5063	21.7907	106.2023	64.8191	25.9708	589.5653

Source: IMPLAN

Butte, Colusa, Glenn, Placer, Sacramento, Sutter, Yolo, and Yuba Counties

INTERINDUSTRY TRANSACTIONS (cont'd.)
(Millions of 1985 Dollars)

Industry	87	131	446	460	464	66	Row Total
1	8.9692	0.0007	0.0009	0.0095	0.0000	2.0896	12.3559
2	27.6909	0.0183	0.0032	0.0374	0.0000	5.2769	103.0928
11	0.0003	0.0543	0.0979	0.1259	0.0097	0.1274	27.1958
12	0.0000	0.0010	0.0000	0.0075	0.0000	0.1937	4.6259
16	0.0505	0.0075	0.0001	0.0962	0.0000	28.7022	67.8996
19	0.0001	0.6664	0.0575	7.0608	12.2013	14.8397	114.2190
32	0.0030	1.1000	1.5274	0.3998	0.0780	13.0874	19.2174
82	0.6089	2.1127	0.0567	0.1626	0.0158	72.3712	128.5565
87	10.7738	0.1115	0.0064	0.0009	0.0000	18.1894	41.5142
131	1.7766	346.6296	7.0749	91.3782	24.6117	302.6310	873.5638
446	0.4150	72.2309	109.8653	69.9951	15.0261	170.0694	514.3663
460	3.2439	155.2237	27.5075	59.8600	12.9379	504.3102	976.7738
464	0.8423	62.2687	29.4904	233.7051	712.0465	471.4999	1,641.1733
66	4.0077	270.9452	107.9820	643.7729	443.3387	1,802.5350	3,476.7599
Column Total	58.3822	911.3706	283.6701	1,106.6118	1,220.2657	3,405.9228	8,001.3141

Source: IMPLAN

Table C-4
Butte, Colusa, Glenn, Placer, Sacramento, Sutter, Yolo, and Yuba Counties

FINAL PAYMENTS: FACTORS
(Millions of 1985 Dollars exc. Employment)

INDUSTRY	EMPLOYEE COMPEN.	INDIRECT BUS TAXES	PROPRIE. INCOME	OTHER PROP. INCOME	TOTAL VALUE ADDED	EMPLOY-MENT
1	18.9448	1.7715	64.7546	16.5872	102.0581	2090.40
2	16.2315	3.4751	55.6077	12.7688	88.0831	1663.02
11	22.7069	4.8249	77.5227	20.6239	125.6786	2364.98
12	3.8622	1.8819	13.3528	4.0732	23.1701	375.17
16	85.6812	5.4683	292.6387	68.5476	452.3358	17829.85
19	108.6513	4.8459	54.7581	-13.1557	155.0996	10557.31
32	40.1590	16.7018	20.3055	64.8010	141.9673	1300.01
82	306.1660	14.4562	16.6224	189.4981	526.7427	11752.00
87	24.4760	0.4846	-1.0244	20.8987	44.8349	688.00
131	1073.9340	18.2750	70.9103	318.7894	1481.9090	36869.00
446	475.6649	20.5189	118.1070	134.6047	748.8954	18642.10
460	2111.4650	566.6835	347.1555	416.4415	3441.7450	92454.00
464	1040.7280	495.7480	418.9781	1362.4440	3317.8980	55648.00
66	9612.8100	517.8911	-1225.0770	2424.9880	11330.6100	310248.00
TOTAL	14,941	1,673	325	5,042	21,981	562,482

Source: IMPLAN

Butte, Colusa, Glenn, Placer, Sacramento, Sutter, Yolo, and Yuba Counties

FINAL PAYMENTS: TRADE
(Millions of 1985 Dollars)

INDUSTRY	COMPETITIVE IMPORTS	NON-COMPETITIVE IMPORTS	TOTAL DOMESTIC IMPORTS	FOREIGN IMPORTS	TOTAL IMPORTS	TOTAL DOME-STIC FINAL PAYMENTS	TOTAL FINAL PAYMENTS	TOTAL INDUSTRY OUTLAYS
1	42.5498	0.0166	42.1250	0.4414	42.5664	144.1831	144.6245	156.9804
2	180.4651	0.1852	178.3658	2.2845	180.6503	266.4489	268.7334	371.8262
11	81.6319	0.0249	76.9029	4.7537	81.6569	202.5816	207.3355	234.5313
12	22.9817	0.2909	22.0644	1.2082	23.2727	45.2345	46.4428	51.0687
16	91.1122	0.0085	85.2681	5.8526	91.1207	537.6039	543.4565	611.3561
19	66.0656	0.3234	62.5987	3.7902	66.3890	217.6984	221.4886	335.7076
32	24.5106	1.4305	22.1102	3.8309	25.9412	164.0776	167.9085	187.1259
82	843.9802	40.6158	831.2875	53.3084	884.5959	1358.0300	1411.3390	1539.8955
87	84.1784	0.0857	83.4567	0.8073	84.2641	128.2917	129.0990	170.6132
131	1184.3900	17.9199	1079.8800	122.4302	1202.3100	2561.7890	2684.2190	3557.7828
446	153.3665	12.5542	140.1576	25.7631	165.9207	889.0530	914.8162	1429.1825
460	419.6028	8.8065	405.7024	22.7069	428.4093	3847.4480	3870.1550	4846.9288
464	222.3632	15.4580	218.6010	19.2202	237.8212	3536.4990	3555.7190	5196.8923
66	3019.4320	54.1597	2776.7670	296.8258	3073.5920	14107.3800	14404.2100	17880.9699
TOTAL	6,437	152	6,025	563	6,589	28,006	28,570	36,571

Source: IMPLAN

Table C-5
Butte, Colusa, Glenn, Placer, Sacramento, Sutter, Yolo, and Yuba Counties

REGIONAL CONSUMPTION DEMAND
(Millions of 1985 Dollars)

	HOUSEHOLDS			GOVERNMENTS				
	PERSONAL CONSUMPTION			FEDERAL			STATE/LOCAL	
INDUSTRY	LOW	MEDIUM	HIGH	PUR/N-MIL	PUR/MIL	CCC	PUR/N-ED	PUR/ED
1	2.7588	4.8728	3.4450	0.0033	0.0120	0.0000	5.8323	0.1219
2	4.3973	6.0449	3.8422	0.0058	0.0105	0.0000	1.0252	0.1564
11	0.0738	0.1452	0.2217	0.0092	0.0009	0.0000	0.4439	0.0093
12	0.0423	0.0664	0.0644	0.0010	0.0000	0.0000	0.1162	0.0165
16	14.0851	25.2965	23.4104	0.0134	0.0011	0.0000	13.9211	1.1936
19	2.1671	3.7218	3.7472	0.0687	0.0000	0.0000	1.3214	4.7591
32	0.6442	1.4495	1.1440	0.2716	0.0751	0.0000	0.1651	0.2606
82	42.0911	77.4013	58.1207	0.0807	0.4111	0.0000	13.9805	1.3216
87	17.4997	33.7860	26.8359	0.0100	0.1597	0.0000	24.9727	0.6701
131	36.6817	71.1600	68.0507	61.1066	47.4405	0.0000	25.8206	19.9617
446	38.8686	67.9813	88.7450	11.0956	8.2205	0.0000	39.5315	14.8913
460	891.7159	1,173.2140	691.6478	14.8203	12.1245	0.0000	18.1437	20.7686
464	591.3567	1,127.2210	905.0759	4.8366	32.1316	0.0000	12.1603	51.8158
66	1,033.4270	1,902.5380	1,852.3280	465.5892	676.0225	0.0000	1,266.1930	781.7235
TOTALS	2,676	4,495	3,727	558	777	0	1,424	898

Source: IMPLAN

Butte, Colusa, Glenn, Placer, Sacramento, Sutter, Yolo, and Yuba Counties

REGIONAL INVESTMENT & TRADE DEMAND
(Millions of 1985 Dollars)

	INVESTMENT		TRADE		TOTAL		
INDUSTRY	INVENTORY ADDITIONS	CAPITAL FORMATION	DOMESTIC EXPORTS	FOREIGN EXPORTS	INTERMED DEMAND	FINAL DEMAND	INDUSTRY OUTPUT
1	0.3686	0.0000	127.8147	0.0878	12.3559	145.4760	157.8319
2	1.7124	0.0000	253.9414	7.8983	103.0928	274.5465	377.6393
11	0.0183	0.0288	126.8879	142.2797	27.1958	270.1348	297.3306
12	0.0107	0.0000	57.6669	5.6721	4.6259	63.6852	68.3111
16	5.3198	0.0000	449.7761	117.7360	67.8996	581.8811	649.7807
19	0.9936	0.0000	148.3758	5.2795	114.2190	175.5163	289.7353
32	0.0217	3.4284	162.2860	11.5770	19.2174	174.7996	194.0170
82	3.0902	0.0038	1,494.4860	171.7870	128.5565	1,865.0690	1,993.6255
87	0.9543	0.0002	40.0147	4.3963	41.5142	147.8141	189.3283
131	16.7971	376.5277	1,658.1530	787.7282	873.5638	2,729.4240	3,602.9878
446	4.2222	22.4086	286.4096	197.5309	514.3663	686.7341	1,201.1004
460	11.9307	272.7170	737.5684	326.1458	976.7738	4,010.3310	4,987.1048
464	0.0000	68.6213	197.5448	195.0545	1,641.1733	3,158.2520	4,799.4253
66	0.0237	2,400.5690	2,563.4290	549.4727	3,476.7599	14,286.3057	17,763.0656
TOTALS	45	3,144	8,304	2,523	8,001	28,570	36,571

Source: IMPLAN

Production Technology

The CVCGEM divides production into three classes. The food grain, feed grain, and other agriculture sectors comprise the first class. Production for this class is determined by the Sacramento Valley Rice Sector Farm Production Model (see Appendix D) and is input into the CVCGEM. Domestic and imported intermediate input demand and value added generated by this production is then determined from intermediate purchase, trade, and factor share parameters. Remaining agricultural sectors comprise the second production class. For this class, the CVCGEM uses a nested multilevel production function in which capital and land are combined in fixed proportions; value-added is determined by a Cobb-Douglas function of labor and the land-capital aggregate; and output is a linear combination of value-added and intermediate inputs. Non-land using industrial and service sectors comprise the third class and also are modeled with a nested multilevel production function. A Cobb-Douglas function combines labor and capital to yield value-added; a linear combination of value-added and intermediate inputs determines output.

Solution Technique

The CVCGEM is a highly non-linear system of equations. A competitive equilibrium for the system is found by maximizing farm sector income.[6] The model is programed in the GAMS language (Brooke, Kendrick, & Meeraus, 1992). A listing of model parameters, variables, and equations is provided at the end of this appendix.

[6]This is a non-standard solution technique for a CGE because it can allow a model sector to behave as a monopolist. However, in the CVCGEM monopolistic behavior is not possible because demands are perfectly elastic.

Appendix C: Equations of the Sacramento Valley CGE in the GAMS Language.

```
$TITLE SACRAMENTO VALLEY CGE - 1985.
$OFFSYMLIST OFFSYMXREF OFFUPPER

*Fixed Price CGE Model for the Sacramento Valley
*Programmed by David Mitchell March 1993
*Adapted from the Fixed Price CGE Model for the San Joaquin Valley
*Created by Sherman Robinson, March-May 1990.

*####################### SET DECLARATION ##############################

 SETS

 I     SECTORS                 / dairy      dairy
                                 lvstck     livestock and poultry
                                 food_gr    food grains (rice)
                                 feed_gr    feed grains & hay & pasture
                                 fruits     fruits nuts vegetables
                                 other_ag   other agriculture
                                 mining     mining & construction
                                 other_mfg  other mfg
                                 agric_mfg  other agric processing
                                 dairy_mfg  dairy processing
                                 freight    motor & railroads
                                 trade      transport trade
                                 banking    banking insurance real estate
                                 other      other /

 F     FACTORS OF PRODUCTION   / labor      labor
                                 capital    capital
                                 land       agricultural land /

 FF(f) Employed factors        / labor      labor
                                 capital    capital /


 INS   INSTITUTIONS            / labr       labor
                                 ent        enterprises /

 HH    HOUSEHOLD TYPE          / low        low income
                                 middle     middle income
                                 high       high income /

*## SUBSETS DEFINED BELOW: "DEFINE INDEXES"

 IAG(I)  AG SECTORS     / dairy, lvstck, food_gr, feed_gr, fruits,
                          other_ag  /
 FPM(I) SECTORS WITH PRODUCTION DETERMINED BY FARM PRODUCTION MODEL
          / FOOD_GR, FEED_GR, OTHER_AG /

 FPMN(I) SECTORS WITH PRODUCTION NOT DETERMINED BY FARM PRODUCTION MODEL

 IAGN(I) NON AG SECTORS

 IE(I)       EXPORT SECTORS
 IED(I)  SECTORS WITH EXPORT DEMAND EQN
 IEDN(I) SECTORS WITH NO EXPORT DEMAND EQN
```

```
 IEN(I)  NON EXPORT SECTORS

 IM(I)        IMPORT SECTORS
 IMN(I)  NON IMPORT SECTORS

 ALIAS(I,J) ;

*## for SAM
 SET ISAM  categories
                      /Industry, Wages, Profits, Land, Entrpr, Indtax,
                       Hlow, Hmid, Hhigh, Govt, Invest, World, Total /
     ISAM1(isam)      /TOTAL/
     ISAM2(isam) ;
 ALIAS(isam2,isam3);
 PARAMETER SAM(isam,isam) SOCIAL ACCOUNTING MATRIX ;
 isam2(isam) = NOT isam1(isam) ;


*######################### PARAMETER DECLARATION ######################

 PARAMETERS

*### READ IN PARAMETERS

*## READ IN FOR INITIALIZATION OF VARIABLES
 ENTTAX0      ENTERPRISE TAX REVENUE
 ENTSAV0      ENTERPRISE SAVINGS
 EXR0         EXCHANGE RATE
 E0(i)        EXPORTS
 FBOR0        NET FOREIGN BORROWING
 FSAV0        NET FOREIGN SAVINGS
 GDTOT0       TOTAL VOLUME OF GOVERNMENT CONSUMPTION
 GENT0        PAYMENTS FROM GOVERNMENT TO ENTERPRISES
 GOVSAV0      GOVERNMENT SAVINGS
 HHSAV0       HOUSEHOLD SAVINGS
 CONSUME0(hh) HOUSEHOLD CONSUMPTION OF DOMESTIC GOODS
 HHT0         HOUSEHOLD TRANSFERS
 INVEST0      TOTAL INVESTMENT
 M0(i)        IMPORTS
 TOTM0        Total value of imports
 MPS0(hh)     HOUSEHOLD MARGINAL PROPENSITY TO SAVE
 PD0(i)       DOMESTIC GOODS PRICE
 PE0(i)       DOMESTIC PRICE OF EXPORTS
 PINDEX0      Price index
 PM0(i)       DOMESTIC PRICE OF IMPORTS
 REMIT0       NET REMITTANCES FROM ABROAD
 REMIT20      Wage payments abroad
 SSTAX0       SOCIAL SECURITY TAX REVENUE
 TOTHHTAX0    HOUSEHOLD TAX REVENUE
 XD0(i)       DOMESTIC OUTPUT VOLUME

* READ IN TABLE FOR INITIALIZATION OF VARIABLES (NEED NOT BE DECLARED)
* TABLE FCTRES1(i,f) FACTOR DEMAND BY SECTOR
* TABLE FCTRY(i,f)   FACTOR INCOME BY SECTOR

*## READ IN PARAMETERS AS RATES, SHARES, ELASTICITIES
 DEPR(i)      DEPRECIATION RATES
 DEPRECIA0    INITIAL DEPRECIATION CHARGE
```

```
 DSTR(i)      RATIO OF INVENTORY INVESTMENT TO GROSS OUTPUT
 ESR0         ENTERPRISE SAVINGS RATE
 ETR          ENTERPRISE TAX RATE
 GLES(i)      GOVERNMENT CONSUMPTION SHARES
 HTAX(hh)     HOUSEHOLD TAX RATE
 ITAX(i)      INDIRECT TAX RATES
 KISH(i)      SHARES OF INVESTMENT BY SECTOR OF DESTINATION
 RHSH(hh)     HOUSEHOLD REMITTANCE SHARE
 RHOC(i)      ARMINGTON FUNCTION EXPONENT
 RHOE(i)      EXPORT DEMAND PRICE ELASTICITY
 RHOT(i)      CET FUNCTION EXPONENT
 SSTR         SOCIAL SECURITY TAX RATE
 TE(i)        EXPORT SUBSIDY RATES
 TM(i)        TARIFF RATES ON IMPORTS
 THSH(hh)     HOUSEHOLD SHARES OF GOVERNMENT TRANSFERS

*### COMPUTED PARAMETERS FROM READ IN DATA (CALIBRATION)

*## COMPUTED PARAMETERS FOR INITIALIZATION OF VARIABLES
 FD0(f)         FACTOR DEMAND, AGGREGATE
 FS0(f)         FACTOR SUPPLY, AGGREGATE
 INT0(i)        INTERMEDIATE INPUT DEMAND
 P0(i)          PRICE OF COMPOSITE GOOD
 PK0(i)         CAPITAL GOODS PRICE BY SECTOR OF DESTINATION
 PVA0(i)        VALUE ADDED PRICE BY SECTOR
 PWM(i)         WORLD MARKET PRICE OF IMPORTS (IN DOLLARS)
 PWMF           World price of imported final demand
 PWE0(i)        WORLD PRICE OF EXPORTS
 PWSE(i)        WORLD PRICE OF EXPORT SUBSTITUTES
 PX0(i)         AVERAGE OUTPUT PRICE
 VAR0(i)        VALUE ADDED RATE BY SECTOR
 WFDIST0(i,f)   FACTOR PRICE SECTORAL PROPORTIONALITY CONSTANTS
 WF0(f)         FACTOR PRICE AGGREGATE AVERAGE
 XXD0(i)        DOMESTIC SALES VOLUME
 X0(i)          COMPOSITE GOOD SUPPLY VOLUME
 YFCTR0(f)      FACTOR INCOME SUMMED OVER SECTOR
 YFLAND0(i)     FACTOR INCOME FOR LAND AS FRACTION OF CAPITAL INCOME
 YFSECT0(i)     FACTOR INCOME BY SECTOR
 YH0(hh)        HOUSEHOLD INCOME
 YINST0(ins)    INSTITUTIONAL INCOME

*## COMPUTED PARAMETERS AS RATES, SHARES
 AC(i)          ARMINGTON FUNCTION SHIFT PARAMETER
 AD(i)          PRODUCTION FUNCTION SHIFT PARAMETER
 ALPHA(i,f)     FACTOR SHARE PARAMETER-PRODUCTION FUNCTION
 AT(i)          CET FUNCTION SHIFT PARAMETER
 DELTA(i)       ARMINGTON FUNCTION SHARE PARAMETER
 ECONST(i)      EXPORT DEMAND CONSTANT
 GAMMA(i)       CET FUNCTION SHARE PARAMETER
 PWTS(i)        PRICE INDEX WEIGHTS
 QD(i)          DUMMY VARIABLE FOR COMPUTING AD(i)
 RMD(i)         RATIO OF IMPORTS TO DOMESTIC SALES
 SUMSH          SUM OF SHARE CORRECTION PARAMETER
 SUMHHSH(hh)    SUM OF SHARE FOR HH CLES
 SUMINS(INS)    INTERMEDIATE SUM
 TMREAL(i)      REAL TARIFF RATE

 IMAT(I)        CAPITAL COEFFICIENTS VECTOR
```

```
 MRAT(I)        IMPORT COEFFIENTS FOR INTERMEDIATES
 MRATC(HH)      IMPORT COEFFICIENTS FOR HOUSEHOLD CONSUMPTION
 MRATZ0         IMPORT COEFFICIENT FOR INVESTMENT
 MRATG          IMPORT COEFFICIENT FOR GOVERNMENT
 YDISP(HH)      DISPOSABLE INCOME
 KLAND(IAG)     CAPITAL LAND RATIOS
;

*## TABLES USED FOR LOADING VARIABLE RESULTS
* TABLE SCALRES(*)      AGGREGATE RESULTS
* TABLE SECTRES(*,i)    SECTORAL PRICE AND QUANTITY RESULTS
* TABLE FCTRES1(i,f)    FACTOR DEMAND RESULTS
* TABLE FCTRES2(*,f)    FACTOR WAGE, SUPPLY AND INCOME REUSLTS
* TABLE INSRES(*,ins)   INSTITUTIONAL INCOME RESULTS
* TABLE HHRES(*,hh)     HOUSEHOLD SAVINGS AND INCOME REUSLTS


*#################### VARIABLE DECLARATION ##########################

*## PRICE BLOCK
   EXR        EXCHANGE RATE                                    ($ PER WORLD $)
   P(i)       PRICE OF COMPOSITE GOODS
   PD(i)      DOMESTIC PRICES
   PE(i)      DOMESTIC PRICE OF EXPORTS
   PINDEX     Price index
   PKPTL      price of capital good
   PM(i)      DOMESTIC PRICE OF IMPORTED intermediates
   PMF        Domestic price of imported final goods
   PVA(i)     VALUE ADDED PRICE
   PWE(i)     WORLD PRICE OF EXPORTS
   PX(i)      AVERAGE OUTPUT PRICE
*## PRODUCTION BLOCK
   E(i)       EXPORTS
   M(i)       IMPORTS
   TOTM       Total imports
   TOTZM      Total imports of capital goods
   mratz      Import ratio for investment goods
   X(i)       COMPOSITE GOODS SUPPLY
   XD(i)      DOMESTIC OUTPUT
   XXD(i)     DOMESTIC SALES
*## FACTOR BLOCK
   FS(f)      FACTOR SUPPLY
   FDSC(i,f)  FACTOR DEMAND BY SECTOR
   WF(f)      AVERAGE FACTOR PRICE
   WFDIST(i,f) Factor rental distortions
   YFCTR(f)   FACTOR INCOME
*## INCOME AND EXPENDITURE BLOCK
   ctot(hh)   Household consumption
   CD(i)      FINAL DEMAND FOR PRIVATE CONSUMPTION
   DEPRECIA   TOTAL DEPRECIATION EXPENDITURE
   DST(i)     INVENTORY INVESTMENT BY SECTOR
   ENTSAV     ENTERPRISE SAVINGS
   ENTTAX     ENTERPRISE TAX REVENUE
   FBOR       NET FOREIGN BORROWING
   FSAV       NET FOREIGN SAVINGS
   FXDINV     FIXED CAPITAL INVESTMENT
   GD(i)      FINAL DEMAND FOR GOVERNMENT CONSUMPTION
   GDTOT      TOTAL VOLUME OF GOVERNMENT CONSUMPTION
```

```
    GENT        PAYMENTS FROM GOVT TO ENT
    GOVSAV      GOVERNMENT SAVINGS
    GR          GOVERNMENT REVENUE
    HHSAV       TOTAL HOUSEHOLD SAVINGS
    HHT         HOUSEHOLD TRANSFERS
    ID(i)       FINAL DEMAND FOR PRODUCTIVE INVESTMENT
    INDTAX      INDIRECT TAX REVENUE
    INT(i)      INTERMEDIATES USES
    INVEST      TOTAL INVESTMENT
    MPS(hh)     MARGINAL PROPENSITY TO SAVE BY HOUSEHOLD TYPE
    esr         Enterprise savings rate
    NETSUB      EXPORT DUTY REVENUE
    REMIT       NET REMITTANCES FROM ABROAD
    REMIT2      Wage payments abroad
    SAVINGS     TOTAL SAVINGS
    SSTAX       SOCIAL SECURITY TAX REVENUE
    TARIFF      TARIFF REVENUE
    TOTHHTAX    HOUSEHOLD TAX REVENUE
    YH(hh)      HOUSEHOLD INCOME
    YINST(ins)  INSTITUTIONAL INCOME
*## GNP CALCULATIONS
    RGNP        REAL GNP
    GNPVA       VALUE ADDED IN MARKET PRICES GNP
    AGRICY      Agricultural income
    LANDY       Return to land
    WAL1        Savings slack variable
    WALOBJ      Model objective function
        ;

*#################### EQUATION DECLARATION ##########################

*## PRICE BLOCK
    PMDEF(i)            DEFINITION OF DOMESTIC IMPORT PRICES
    PMDEFF              Domestic import price for final demand
    PEDEF(i)            DEFINITION OF DOMESTIC EXPORT PRICES
    ABSORPTION(i)       VALUE OF DOMESTIC SALES
    SALES(i)            VALUE OF DOMESTIC OUTPUT
    ACTP(i)             DEFINITION OF ACTIVITY PRICES
    PKAP                Capital good price by sector of destination
    PINDEXDEF           DEFINITION OF GENERAL PRICE LEVEL
*## PRODUCTION BLOCK
    ACTIVITY(i)         PRODUCTION FUNCTION
    PROFITMAX(i,ff)     FIRST ORDER CONDITIONS FOR PROFIT MAXIMUM
    INTEQ(i)            TOTAL INTERMEDIATE USES
    CET(i)              CET FUNCTION
    ARMINGTON(i)        COMPOSITE GOOD AGGREGATION FUNCTION
    ARMINGTON2(i)       COMPOSITE GOOD AGG. FOR NONTRADED SECTORS
    COSTMIN(i)          F.O.C. FOR COST MINIMIZATION OF COMPOSITE GOOD
*## INCOME BLOCK
    YFCTREQ(f)          FACTOR INCOME
    LABORY              LABOR INCOME
    ENTY                ENTERPRISE INCOME
    HHY(hh)             HOUSEHOLD INCOME
    TARIFFDEF           TARIFF REVENUE
    INDTAXDEF           INDIRECT TAXES ON DOMESTIC PRODUCTION
    NETSUBDEF           EXPORT SUBSIDIES
    TAXSS               SOCIAL SECURITY TAX
    ETAX                ENTERPRISE TAX
```

```
   HHTAXDEF          TOTAL HOUSEHOLD TAXES COLLECTED BY GOVT.
   ESAVE             ENTERPRISE SAVINGS
   HHSAVEQ           HOUSEHOLD SAVINGS
   GREQ              GOVERNMENT REVENUE
   TOTSAV            TOTAL SAVINGS
*## EXPENDITURE BLOCK
   ctotal(hh)        Total household consumption
   CDEQ(i)           PRIVATE CONSUMPTION BEHAVIOR
   GDEQI(i)          GOVT CONSUMPTION OF COMMODITIES
   GRUSE             GOVERNMENT SAVINGS
   DSTEQ(i)          Inventory investment
   FIXEDINV          Fixed investment
   ieq(i)            Investment demand
   importd           Import demand
   importz           Total imports of investment goods

*## MARKET CLEARING
   EQUIL(i)          GOODS MARKET EQUILIBRIUM
   FMEQUIL(f)        FACTOR MARKET EQUILIBRIUM
   CAEQ              CURRENT ACCOUNT BALANCE (BILL DOLLARS)
   WALRAS            SAVINGS INVESTMENT EQUILIBRIUM
*## Residual land income
   LAND1             Land income defined residually
   LAND2             Return to land for objective function
   LAND4(iag)        Capital land ratios
   AGRIC             Total agricultural income
   OBJ               Model objective function

*## GROSS NATIONAL PRODUCT
   GNPY              TOTAL VALUE ADDED INCLUDING INDTAX
   GNPR              REAL GNP
        ;


*########################## EQUATION ASSIGNMENT  ########################

*## PRICE BLOCK

 PMDEF(im)..      PM(im)   =E= PWM(im)*EXR*(1 + TM(im)) ;
 PMDEFF..         PMF      =E= pwmf*EXR ;
```

These equations express the relation between the border price of imports (pm) or exports (pe), the corresponding world prices, tariif rates and the exchange rate. The the Sacramento Valley model, these tariff rates are all zero and the exchange rate is fixed at one.

```
 PEDEF(ie)..      PE(ie)   =E= PWE(ie)*(1 + TE(ie))*EXR ;
```

Export price definition.

```
 ABSORPTION(i)..  P(i)*X(i)  =E=  PD(i)*XXD(i) ;

 SALES(i)..       PX(i)*XD(i) =E= PD(i)*XXD(i) + (PE(i)*E(i))$ie(i) ;
 ACTP(i)..        PVA(i)  =E= PX(i)*(1.0 - ITAX(i)) - SUM(j,IO(j,i)*P(j))
                              - MRAT(i);
```

The value-added per unit is the price of the product less indirect taxes, less the value of inputs used, less the value of imports used in production.

```
 PKAP..          PKPTL   =E= SUM(j, IMAT(j)*P(j)) ;
```

This defines the price of capital in each sector as the weighted average of sectoral output prices.

```
 PINDEXDEF..     PINDEX  =E= sum(i,pwts(i)*PX(i)) ;
```

This defines the producer price index.

```
*## PRODUCTION BLOCK

 ACTIVITY(fpmn)..   XD(fpmn)   =E= AD(fpmn)*PROD(f$ALPHA(fpmn,f),
                                FDSC(fpmn,f)**ALPHA(fpmn,f));
```

Output for non-farm production model sectors is a Cobb-Douglas function of the factor inputs (capital, labor, and land).

```
 PROFITMAX(fpmn,ff)$WFDIST0(fpmn,ff)..WF(ff)*WFDIST(fpmn,ff)*FDSC(fpmn,ff) =E=
                                          XD(fpmn)*PVA(fpmn)*ALPHA(fpmn,ff) ;
```

Factor demand equations obtained from first-order profit maximization conditions.

```
 INTEQ(i)..      INT(i)  =E= SUM(J, IO(i,j)*XD(j));
```

Intermediate demand by commodity is the sum of sectoral intermediate demands.

```
 CET(ie)..       XD(ie)  =E=  XXD(ie) + E(ie) ;
```

In this version, exports and domestic sales are perfect substitutes.

```
 ARMINGTON(im)..   X(im)  =E= XXD(im) ;
```

In this version, imports and domestic product are perfect substitutes.

```
 ARMINGTON2(imn).. X(imn) =E= XXD(imn) ;
```

In sectors with no imports, absorption equals domestic sales.

```
 COSTMIN(im)..     M(im)  =E= mrat(im)*XD(im) ;
```

In this version, imports are a fixed fraction of domestic production.

```
*## INCOME BLOCK

 YFCTREQ(ff)..   YFCTR(ff) =E= SUM(i, WF(ff)*WFDIST(i,ff)*FDSC(i,ff));
```

Total income accruing to each factor is the sum over the sectors of factor incomes.

```
 AGRIC..         AGRICY =E= SUM(iag, PVA(iag)*XD(iag)) ;
```

Total value-added of agricultural production.

```
 LAND1..         YFCTR("land") =E= AGRICY - SUM(iag,
                           SUM(ff, WF(ff)*WFDIST(iag,ff)*FDSC(iag,ff))) ;
```

Land to income defined as the residual claimant of agricultural value added.

```
LAND2..          LANDY =E= YFCTR("land") + SUM(iag, WF("capital")
                         *WFDIST(iag,"capital")*FDSC(iag,"capital")) ;

LAND4(iag)..     FDSC(iag,"capital") =E= kland(iag)*FDSC(iag,"land") ;

LABORY..         YINST("labr") =E= YFCTR("labor") - SSTAX + REMIT2*EXR ;
```

Definition of labor income.

```
ENTY..           YINST("ent")  =E= YFCTR("capital") + GENT
                                 + YFCTR("land") - DEPRECIA ;
```

Definition of income to enterprises.

```
HHY(hh)..        YH(hh) =E= SUM(ins, SINTYH(hh,ins)*YINST(ins))
                          + REMIT*RHSH(hh)*EXR + HHT*THSH(hh) ;
```

Definition of household income.

```
TARIFFDEF..      TARIFF =E= SUM(im, TM(im)*M(im)*PWM(im))*EXR ;
NETSUBDEF..      NETSUB =E= SUM(ie, TE(ie)*E(ie)*PWE(ie))*EXR ;
```

These equations define total tariffs and export subsidies. These are zero in the Sacramento Valley model.

```
INDTAXDEF..      INDTAX =E= SUM(i, ITAX(i)*PX(i)*XD(i)) ;
```

Total indirect tases equal the sum of sectoral indirect taxes.

```
TAXSS..          SSTAX  =E= SSTR*YFCTR("labor") ;
```

Definition of social security taxes.

```
ETAX..           ENTTAX =E= ETR*YINST("ent") ;
```

Definition of enterprise taxes

```
HHTAXDEF..       TOTHHTAX =E= SUM(hh, HTAX(hh)*YH(hh)) ;
```

Definition of HH taxes.

```
ESAVE..          ENTSAV   =E= ESR*YINST("ent") ;
```

Definition of enterprise savings.

```
HHSAVEQ..        HHSAV    =E= SUM(hh, MPS(hh)*YH(hh)*(1 - HTAX(hh))) ;
```

Definition of HH savings.

```
GREQ..           GR       =E= TARIFF - NETSUB + INDTAX +TOTHHTAX +
                              SSTAX + ENTTAX + FBOR*EXR ;
```

Definition of Government revenues.

```
TOTSAV..         SAVINGS =E= HHSAV + GOVSAV + DEPRECIA + FSAV*EXR + ENTSAV ;
```

Total savings equals the sum of household savings, depreciation, enterprise savings and foreign savings or the current account deficit.

```
*## EXPENDITURE BLOCK

 CTOTAL(hh)..     ctot(hh) =E= (1-mps(hh))*(1-htax(hh))*(1-mratc(hh))*YH(hh) ;
```

Definition of total household disposable income.

```
 CDEQ(i)..        P(i)*CD(i) =E= SUM(hh, CLES(i,hh)*ctot(hh)) ;
```

Consumer demand is generated by applying constant budget shares to expenditure on domestic products.

```
 GDEQI(i)..       GD(i)  =E= GLES(i)*GDTOT ;
```

Government demand is generated by applying constant budget shares to expenditure on domestic products.

```
 GRUSE..          GR     =E= SUM(i, P(i)*GD(i)) + GOVSAV + GENT + HHT
                             + mratg*GDTOT*pmf ;
```

Government savings is government revenue less domestic government consumption, government transfers, and government imports.

```
 DSTEQ(i)..       DST(i) =E= DSTR(i)*XD(i) ;
```

The change in stocks is a fixed fraction of sectoral output.

```
 FIXEDINV..       FXDINV =E= INVEST - SUM(i, DST(i)*P(i)) ;
```

Fixed investment is gross investment less inventory accumulation.

```
 IMPORTZ..        TOTZM  =E= mratz*pwmf*FXDINV/PKPTL ;
```

Imports of capital are a fixed fraction of fixed investment.

```
 IMPORTD..        TOTM   =E= SUM(im, M(im)*pwm(im)) + mratg*pwmf*GDTOT
           + TOTZM
           + SUM(hh, mratc(hh)*(1-mps(hh))*(1-htax(hh))*YH(hh)*pwmf/pmf) ;
```

Defintion of total imports.

```
 IEQ(i)..         ID(i)  =E= imat(i)*(1 - mratz)*fxdinv/PKPTL ;
```

Investment demand by sector.

```
*## MARKET CLEARING

 EQUIL(i)..       X(i)   =E= INT(i) + CD(i) + GD(i) + ID(i) + DST(i) ;
```

Market equilibrium, supply (X) equals demand.

```
 FMEQUIL(f)..     SUM(i, FDSC(i,f)) =E= FS(f) ;
```

Factor market equilibrium.

```
 CAEQ..           TOTM =E= SUM(ie, PWE(ie)*E(ie))
                                 +  FSAV + REMIT + REMIT2 + FBOR ;
```

Current account balance.

```
 WALRAS..         SAVINGS =E= INVEST + WAL1 ;
```

```
*
By Walras' Law savings equals investment.  In the Sacramento Valley model this
equation is redundant.

*## GROSS NATIONAL PRODUCT

 GNPY..          GNPVA =E= SUM(i,PVA(i)*XD(i)) + INDTAX + TARIFF ;

 GNPR..          RGNP =E= SUM(i,CD(i) + DST(i) + ID(i) + GD(i))
                  + SUM(ie,E(ie)) - TOTM ;
*
Gross regional product.
```

Appendix D

Sacramento Valley Rice Sector Farm Production Model

Appendix D

Sacramento Valley Rice Sector Farm Production Model

Farm level response to the phase-down of residue burning will depend on available alternative straw disposal practices; market opportunities; and production constraints imposed by land quality, technology, markets, and government programs. To assess farm level responses to alternative phase-down scenarios, a farm-production sub-model of the Sacramento Valley's rice sector was developed (Baum and Schertz 1983; Hazel and Norton 1986; Kutcher and others 1985). This model was designed to work in conjunction with the CGE model used to forecast regional economic impacts by providing estimates of the likely farm-level production responses to restrictions on rice-straw burning. The model selects alternative straw disposal practices, crops, and production levels on the basis of farm income maximization subject to the regional production and market constraints. The resultant changes to farm sector demands for inputs and supplies of outputs are entered into the regional CGE model, which then assesses how these production choices cycle through the regional economy as a whole. Changes to regional economic parameters, such as prices, can then be feedback into the farm-production sub-model which will again adjust production to maximize farm income.[1] This appendix describes the structure, assumptions, and data sources for the farm-production sub-model.

Definition of Regions, Crops, Soil Types, and Yields

The analysis extends across eight counties within the Sacramento Valley. The set of counties, J, is shown below. These counties account for roughly 95 percent of the state's rice production (California Department of Food and Agriculture 1991).

J = {Butte, Colusa, Glenn, Placer, Sacramento, Sutter, Yolo, Yuba}

The model estimates production choices on the rice base acreage for these counties (i.e., acreage enrolled in the federal rice program). Analysis is restricted to the rice base because comprehensive information is available on this acreage, and enrollment in the rice program by Sacramento Valley rice growers approaches 100 percent (U.S.D.A. 1991).

U.S. Soil Conservation Service County Soil Surveys provided the raw data to construct the crop, soil type, yield, and acreage profiles for each county's rice base. The surveys provide information on acreage and potential crop yields associated with each soil type in a county. Typically, a soil survey will list two to three hundred soil types. Several crops can usually grow on each soil type, although some soils are suited for only one or two.

Soil conditions limit crop production on much of the rice base acreage in the Sacramento Valley, primarily because its soil tends to consist of dense clay with poor drainage. To account for this, the rice base for each county is disaggregated by soil type using the soil classification data from the soil surveys. Soil types used by the model are indexed by k; the model contains 63 soil types (K = {1, ..., k, ... 63}).

Because the analysis is restricted to the region's rice base, only soil types identified by the soil surveys as able to grow rice are included. Crops that can grow on at least one of the soil types in the model also are included to allow for substitution responses to the residue burning phase-out. The set of crops, I, is shown below.

I = {rice, wheat, barley, corn, sorghum, safflower, alfalfa, pasture, sugar beets, proc. tomatoes}

---

[1]The scenarios examined in this report do not result in measurable regional price changes. Therefore, single iterations of the farm production sub-model and the regional CGE model suffice.

Yield potential for each crop-soil type combination (i, k) are computed from a soil survey's yield data.[2] To use these data in the model it was necessary to first update the yields to a common 1985-89 yield base. This was done using equation (1) and information on yields from County Agricultural Commissioner's reports.

$$(1)\quad Y_{ijk} = \left[1 + \left(\frac{Y^{o}_{ijk} - \overline{Y}^{o}_{ij}}{\overline{Y}^{o}_{ij}}\right)\right]\overline{Y}^{c}_{ij} \qquad \forall i \in I, j \in J, k \in K$$

In (1) Y_{ijk} is the updated yield for crop i, county j, and soil type k; Y^{o}_{ijk} is the original yield estimate listed in a soil survey; $\overline{Y}^{o}_{ij}$ is the acreage weighted average yield across soil types; and $\overline{Y}^{c}_{ij}$ is the 1985-89 average yield from the County Agricultural Commissioner's reports. This adjustment preserves the relative yield differences across soil types.

The total acreage reported by a county's soil survey as capable of growing rice exceeds the rice base acreage for the counties in the model. This is expected because rice can be grown on a wide variety of soil types, though it is better suited to some than others. A linear program was used to select the rice acreage base for the production model. The program, shown in (2), maximizes farm income within a county by selecting acreage from the land types in K to produce base year crops. In this program, acreage from soil type k, growing crop i, in county j is identified as L_{ijk}. The program constrains total acreage planted to any one crop to the observed base year level, $\hat{L}_{ij}$, as reported in the Agricultural Commissioner's reports. In this way, soil types are assigned to the crop (or crops) for which they have a comparative advantage. This calibrates the model so that it replicates base year rice production.

$$\max_{L_{ijk}} \quad Rev_j = \sum_{i \in I} p_i Y_{ijk} L_{ijk} - C_i \qquad \forall j \in J$$

$$(2)\quad \text{s.t.}$$

$$\sum_{k \in K} L_{ijk} \le \hat{L}_{ij} \qquad \forall i \in I$$

The acreage for soil type k in county j used by the production model is given by (3), where $\tilde{L}_{ijk}$ are the solution values from (2).

$$(3)\quad L_{jk} = \sum_{i \in I} \tilde{L}_{ijk} \qquad \forall j \in J, k \in K$$

Constraints on Production

The rice production model specifies several constraints on production and market opportunities. These are outlined below.

---

[2]If the crop is not listed for a given soil type, the yield potential is assumed zero. This is because the County Soil Surveys only list crops that are commonly and profitably grown on a given soil type. For instance, heavy clays limit some soils to growing only rice; others can grow rice, grains, and forage but suffer below average yields for non-rice crops; and others can grow a broader spectrum of crops, including sugar beets and processing tomatoes.

Land Constraint

Planted and federal set-aside acreage for all crops planted in county j on land type k must be less than or equal to plantable acreage defined by (3). The land constraint is specified by (4). The scalar acr_i is crop i's set-aside requirement. The set-aside requirement determines the percentage of a crop's base acreage that must be left fallow for the remaining acreage to receive federal income support payments. The set-aside requirement only applies to crops that are part of the federal farm program. In this model, it is assumed that rice is the only crop grown on the rice base that will participate in the farm program. Therefore, $acr_i = 0$ for all $i \neq$ rice. For rice, $acr_r = 0.20$.

$$(4)\quad \sum_{i \in I}\left(1+\frac{acr_i}{1-acr_i}\right)X_{ijk} \le L_{jk} \qquad \forall j \in J, k \in K$$

Sacramento Ethanol Plant Demand Constraint

The proposed ethanol plant (see Appendix A) will collect rice straw from within the plant's supply radius. Equation (5) constrains rice acreage supplying straw to the plant to be less than or equal to the plant's expected annual demand for straw.

$$(5)\quad \sum_{j \in \bar{J}}\sum_{k \in K} X^{e}_{rjk} \le \frac{S}{\alpha T_r} \qquad \text{where } \bar{J} \text{ is the subset of counties within the plant's supply radius.}$$

In (5) X^{e}_{rjk} is acreage planted to rice and supplying straw to the plant; S is the ethanol plant's annual demand for straw in tons; T_r is the per acre yield of rice straw; and α is the per acre straw recovery factor. The proposal for the plant lists S = 100,000 tons, $\alpha = 0.75$, and $T_r = 3$ tons.

Tomato and Beet Production

The model does not allow for the substitution of tomatoes or sugar beets for the production of rice as a result of the phase-down of open field burning. Tomato and sugar beet production is contracted with processors. These contracts are valuable but relatively hard to secure and the ability to switch from rice into these crops is, according to growers, extremely limited (Rice Growers Focus Group 1992). The constraint is given by (6).

$$(6)\quad \begin{aligned} X_{tjk} &= 0 \qquad \forall j \in J, k \in K \\ X_{bjk} &= 0 \qquad \forall j \in J, k \in K \end{aligned}$$

Model Objective Function

The model determines crop production on the region's rice base by maximizing net revenue as defined by (7) subject to (4), (5) and (6).

$$(7)\quad \text{Max} \quad Rev = \sum_{i \in I}\sum_{j \in J}\sum_{k \in K}\left(p_i\theta_i Y_{ijk} - (C_i + D_i)\right)X_{ijk} + \sum_{j \in \bar{J}}\sum_{k \in K}(p_E T_r)X^{e}_{rjk} + \sum_{j \in J}\sum_{k \in K} p_{USDA} X_{rjk}$$

In (7), p_i is the expected price for crop i; θ_i is a yield adjustment parameter to allow for yield differences across incorporation methods; C_i is the average per acre variable production cost for crop i; D_i is the per acre cost of residue disposal ($D_i = 0$ for $i \neq r$); p_E is the price offered by the proposed Sacramento ethanol plant for rice straw (in this case, the proposal is to pay for collection costs); T_r is the per acre yield of rice straw; and p_{USDA} is the per acre cost share for non-burn rice straw disposal. Data

sources and assumptions for the parameters in (7) are detailed in Section 5. The model is programmed in GAMS (Brooke and others 1992). A listing of parameters, variables, equations, and scenario run is placed at the back of this appendix.

```
   $TITLE SACRAMENTO VALLEY RICE BASE FARM PRODUCTION MODEL - 1985.
      * DATE: 3.15.93
      * ARB FARM PRODUCTION MODEL
      * PROJECT: ARB RICE

      * COUNTY ASSIGNMENTS
      * CO1 BUTTE
      * CO2 COLUSA
      * CO3 GLENN
      * CO4 PLACER
      * CO5 SACRAMENTO
      * CO6 SUTTER
      * CO7 YOLO
      * CO8 YUBA

      * CROP ASSIGNMENTS
      * RCE1 RICE FIELD BURNING
      * RCE2 RICE SOIL INCORPORATION
      * RCE3 RICE FIELD REMOVAL
      * WHT WHEAT
      * BAR BARLEY
      * SOR SORGHUM
      * CRN CORN
      * SAF SAFFLOWER
      * ALF ALFALFA
      * PAS PASTURE
      * BTS SUGAR BEETS
      * TOM PROCESSING TOMATOES

      $OFFSYMLIST OFFSYMXREF
      OPTION LIMROW = 0;
      OPTION LIMCOL = 0;
      OPTION SOLPRINT = OFF;
      OPTION ITERLIM = 5000;

      SET C CROPS /RCE1,RCE2,RCE3,WHT,BAR,SOR,CRN,SAF,ALF,PAS,BTS,TOM/
      SET OTHER(C) SAFFLOWER PRODUCTION /SAF/
      SET FEED(C) FEED GRAIN & ALF & PASTURE /WHT,BAR,SOR,CRN,ALF,PAS/
      SET FOOD(C) RICE PRODUCTION /RCE1,RCE2,RCE3/
      SET CO COUNTIES /CO1*CO8/
      SET ETH(CO) ETHANOL COUNTIES / CO4*CO7 /
      SET ETHN(CO) NON ETHANOL PLANT SUPPLYING COUNTIES / CO1*CO3,CO8/
      SET L LAND TYPES /L1*L63/

      PARAMETERS

      TREVENUE(C)     TOTAL REVENUE FROM PRODUCING C
      REVENUE(C,CO)   TOTAL REVENUE FROM PRODUCING C IN CO
      TRETURN(C)      TOTAL PER ACRE RETURN TO LAND CAP. MGMT FROM PRODUCING C
      RETURN(C,CO)    TOTAL PER ACRE RETURN TO LAND CAP. MGMT FROM PRODUCING C
AT CO
      PRICE(C) 1985 DOLLARS PER TON PRICE
      COST(C) DOLLARS PER ACRE VARIABLE COST
      ;

      SCALAR ACR ASCS ACREAGE SET-ASIDE FOR RICE /0.30/
             INCORP PER ACRE COST TO SOIL INCORPORATE /20./
             REMOVE PER ACRE COST TO REMOVE STRAW FROM FIELD /75./
```

```
*       TRANS. DIST 10-15 MI. 75% UTILIZATION FACTOR
;

COST('RCE2') = COST('RCE2') + INCORP;

COST('RCE3') = COST('RCE3') + REMOVE;

*### CONVERT TO $MM 1985
COST(C) = COST(C)/1000000.;
PRICE(C) = PRICE(C)/1000000.;

VARIABLES
XCROP(C,CO,L)  ACRES PLANTED TO C ON L AT CO
TCROP(C)       TOTAL ACRES OF RICE BASE PLANTED TO C
CROP(C,CO)     TOTAL ACRES OF RICE BASE PLANTED TO C AT CO
ETHDMND        TOTAL ACRES OF RICE SUPPLYING ETHANOL PLANT
TONS(C,CO)     OUTPUT OF CROP C FROM CO
PRODCOST(C,CO) TOTAL VARIABLE COST TO PRODUCE C AT CO
YFARM          FARM INCOME NET OF VARIABLE COSTS
;

POSITIVE VARIABLE TONS,XCROP
;

EQUATIONS
LANDBAL(CO,L)  COUNTY LAND BALANCE       (ACRES)
ATCROP(C)      PLANTED ACREAGE OF CROP C (ACRES)
ACROP(C,CO)    COUNTY CROP ACREAGE       (ACRES)
ETHDEMAND      ETHANOL PLANT DEMAND      (ACRES)
ATONS(C,CO)    TONS OF OUTPUT     (TONS)
OBJ            OBJECTIVE FUNCTION        (DOLLARS)
;

LANDBAL(CO,L).. SUM(C,XCROP(C,CO,L))
                 +(ACR/(1-ACR))*SUM(FOOD,XCROP(FOOD,CO,L))=L=LAND(L,CO);

ATCROP(C).. TCROP(C) =E= SUM((L,CO),XCROP(C,CO,L));

ACROP(C,CO).. CROP(C,CO) =E= SUM(L,XCROP(C,CO,L));

ETHDEMAND.. ETHDMND =E= SUM(ETH,CROP('RCE1',ETH));

ATONS(C,CO).. TONS(C,CO) =E= SUM(L,XCROP(C,CO,L)*YIELD(L,CO,C));

OBJ..    YFARM    =E=    SUM((C,CO),PRICE(C)*TONS(C,CO))    -
SUM(C,COST(C)*TCROP(C));

MODEL FARM_PROD /ALL/;

XCROP.LO(C,CO,L) = 0;
TONS.LO(C,CO) = 0;
TCROP.UP('TOM') = 0;
TCROP.UP('BTS') = 0;

* # # # # # # # # # # # # # # # # # # # # # # # # #        B A S E        R U N
########################################
* FIELD BURNING
* NO COST SHARE
```

```
      * NO ETHANOL PLANT DEMAND

      SOLVE FARM_PROD USING LP MAXIMIZING YFARM;

      * # # # # # # # # # # # # # # # # # # # # # # # # #        S C E N A R I O        1
#####################################
      * NO FIELD BURN
      * NO YIELD LOSS
      * NO ETHANOL PLANT DEMAND
      * NO USDA COST SHARE

      CROP.UP('RCE1',ETH) = 0;
      COST(FOOD) = COST(FOOD) + (8.75/1000000.);

      YIELD(L,CO,'RCE2') = (1.00/0.80)*YIELD(L,CO,'RCE2');

      SOLVE FARM_PROD USING LP MAXIMIZING YFARM;

      * # # # # # # # # # # # # # # # # # # # # # # # # #        S C E N A R I O        2
#####################################
      * FIELD BURNING PROHIBITED
      * ETHANOL PLANT DEMAND - 44400 ACRES
      * USDA COST SHARE - 8.75 PER ACRE
      * NO YIELD LOSSES

      COST(FOOD) = COST(FOOD) - (8.75/1000000.);
      CROP.UP('RCE1',ETHN) = 0;
      ETHDMND.UP = 44400.;

      SOLVE FARM_PROD USING LP MAXIMIZING YFARM;

      * # # # # # # # # # # # # # # # # # # # # # # # # #        S C E N A R I O        3
#####################################
      * NO FIELD BURN
      * YIELD LOSS - 5%
      * ETHANOL PLANT DEMAND - 44000 ACRES
      * USDA COST SHARE - 8.25 PER ACRE

      YIELD(L,CO,'RCE2') = 0.95*YIELD(L,CO,'RCE2');

      SOLVE FARM_PROD USING LP MAXIMIZING YFARM;

      * # # # # # # # # # # # # # # # # # # # # # # # # #        S C E N A R I O        4
#####################################
      * NO FIELD BURN
      * YIELD LOSS - 10%
      * ETHANOL PLANT DEMAND - 44000 ACRES
      * USDA COST SHARE - 8.25 PER ACRE

      YIELD(L,CO,'RCE2') = (0.90/0.95)*YIELD(L,CO,'RCE2');

      SOLVE FARM_PROD USING LP MAXIMIZING YFARM;

      * # # # # # # # # # # # # # # # # # # # # # # # # #        S C E N A R I O        5
#####################################
      * NO FIELD BURN
      * YIELD LOSS - 20%
      * ETHANOL PLANT DEMAND - 44000 ACRES
```

```
      * USDA COST SHARE - 8.25 PER ACRE

      YIELD(L,CO,'RCE2') = (0.80/0.90)*YIELD(L,CO,'RCE2');

      SOLVE FARM_PROD USING LP MAXIMIZING YFARM;

      * # # # # # # # # # # # # # # # # # # # # # # # #        S C E N A R I O        6
####################################
      * NO FIELD BURN
      * YIELD LOSS - 10%
      * NO ETHANOL PLANT DEMAND
      * NO USDA COST SHARE


      YIELD(L,CO,'RCE2') = 0.90*YIELD(L,CO,'RCE2');

      SOLVE FARM_PROD USING LP MAXIMIZING YFARM;
```

Appendix E

Waterfowl Preserves

Appendix E

E.1 Waterfowl Preserves

Waterfowl preserves offer a potential to reduce the costs and risks associated with straw soil incorporation. That is, creating waterfowl habitat on ricelands is not an independent rice straw disposal alternative, but rather, it is one aspect of the most likely alternative to burning: incorporating the straw into the soil. A discussion of the implications of the creation of waterfowl preserves to rice production necessarily entails a discussion of soil incorporation. As a result, this brief offers only a partial treatment of this topic. Readers are encouraged to examine Chapters Two and Three for a more comprehensive treatment of soil incorporation issues.

E.2 Waterfowl Management

Post-harvest soil incorporation of rice straw followed by field flooding offers a potential alternative to field burning. A major disadvantage of this disposal alternative is that the straw may not decompose before next season's planting. Recent investigations suggest that attracting waterfowl to the field may hasten the decomposition of rice straw, making this alternative more viable.

Recent biological surveys also show that rice lands in the Sacramento Valley provide an important source of food and habitat for waterfowl migrating along the Pacific Flyway. Increasing this food and habitat potential is one objective of the California Central Valley Habitat Joint Venture (CCVHJ), a coalition of private interest groups and public agencies created by the North American Waterfowl Management Plan. In partial fulfillment of this objective, the CCVHJ is advocating conjunctive use of rice lands for the production of rice and the enhancement of waterfowl habitat. Incorporating the straw into the soil and then flooding rather than burning the field after harvest may increase the habitat potential of a rice field.

This sub-section discusses the relationship between waterfowl and rice land in the Sacramento Valley, and how soil incorporation of rice straw could enhance this relationship.

E.3 The Pacific Flyway

The Central Valley is the winter home to roughly sixty percent of the ducks, geese, swans, and other waterfowl migrating along the Pacific Flyway. It is the exclusive wintering area for the endangered Aleutian Canada goose, and it provides habitat to countless other increasingly rare bird species, such as cranes, ibis, herons and egrets. In total, some 10 to 12 million water use birds visit the Valley at some point during their annual migratory cycle (Gilmer et al., 1982).

Seasonal wetlands within the Valley provide critical habitat to these birds. The Valley's wetlands are the bed and breakfast of the Pacific Flyway, providing breeding grounds and up to 750 pounds of food per acre.[1]

---

[1]WESCO, 1991.

This critical habitat is in sharp decline. In the past 100 years 95 percent of the Central Valley's wetlands have been lost, primarily to agriculture, but also to commercial and residential development. Today, less than 300,000 acres of wetlands remain. As a result, bird populations dependent on this habitat also are in decline. During the last 30 years, the number of ducks using the Central Valley has declined by 50 percent.[2]

In response to declining waterfowl populations, a coalition of concerned interest groups and public agencies instituted the CCVHJV, with the goal of protecting existing wetlands, establishing new wetlands, and improving habitat potential on existing agricultural lands.

E.4 Rice Land: An Important Source of Waterfowl Food and Habitat

According to the CCVHJV, the rice lands of the Sacramento Valley could prove an important component in their overall waterfowl restoration effort. Rice acreage provides an excellent food source for migrating waterfowl. Each acre can potentially yield 250 to 350 pounds of waste rice as well as about 250 pounds of natural foods, such as invertebrates and tubers, for a total of 500 to 600 pounds of food per acre.[3] This amount of food implies that an acre planted to rice can potentially yield between 70 and 80 percent of food produced by an acre of natural wetland. Rice left in the fields after harvest has been found to provide nearly 100 percent of a pintail duck's diet during the fall, and radio-tagged mallards were found to spend about 80 percent of their nocturnal feeding in harvested rice fields.[4]

Additionally, rice-acreage idled by federal crop price support programs provide much needed nesting habitat for waterfowl. Recent waterfowl population surveys have shown set-aside acreage to have higher than average nesting densities and breeding success rates (WESCO, 1991).

E.5 Soil Incorporation and Winter Flooding

With a goal of providing habitat for 4.7 million wintering waterfowl and 490,000 breeding ducks, the CCVHJV is hoping to enhance the waterfowl habitat potential of the Valley's rice acreage. The CCVHJV, in cooperation with the rice industry, is pursuing a pilot program to study whether incorporating rice straw into the soil after harvest and then flooding the field will increase bird densities in the region. While this program is still in its planning stage, some details have emerged. The program aims to flood 5 to 10 thousand acres planted to rice after the 1992 harvest and leave the fields flooded until March when they will be drained and prepared for the 1993 planting. Preferably, participating acreage will remain unburned before flooding, but fields that are burned may also be used in the study. After flooding, wildlife responses will be monitored. The program also could point to a potential alternative to field burning for disposing of rice straw.

---

[2]CCVHJV Info. Pamphlet.

[3]WESCO, 1991.

[4] Miller, 1987; Day, et al., 1990.

E.6 Waterfowl May Hasten Decomposition of Rice Straw

Slow straw decomposition is a primary barrier to rice growers' adopting soil incorporation as a substitute for field burning. The general belief among growers is that undecomposed rice straw left in fields decreases yields. According to growers, the straw tangles in machinery, increases seedling dislodgment, consumes nitrogen targeted for plant growth, and fosters stem rot.[5] Although there are several farms in the valley that currently incorporate rice straw into their fields, an overwhelming majority of growers do not.

Attracting a flock of waterfowl to the land after soil incorporation may hasten straw decomposition. As the birds feed on the left-over grain floating on the water's surface, and feed on the invertebrates living in the water, they churn the straw which speeds up its breakdown. Additionally, the dung deposited by the bird's waste introduces nitrogen into the flooded field. Nitrogen also hastens rice straw decomposition.

If the CCVHJ successfully demonstrates that the actions of waterfowl can sufficiently hasten straw decomposition, then farmers may be less reluctant to adopt this alternative to field burning. Even so, this alternative will increase production risks, at least in the short-run, and raise production costs.

While waterfowl could serve to hasten straw decomposition, some growers have expressed concern over its relationship to the federal Endangered Species Act. Some farmers believe that if a significant number of rare and endangered wildfowl makes a home in their fields, it would jeopardize their ability to continue to utilize their fields for rice production. We have not examined this concern for its analytical basis. However, the fact that growers have concerns related to this issue would act to diminish grower participation in preserves.

E.7 Factors Affecting Adoption of Wildlife Preserves

Factors that could affect whether or not existing rice fields will ultimately become wildlife preserves include the following:

- Whether or not waterfowl preserves will include some government payment to rice growers.
- The implications of delayed planting schedules created by waterfowl preserves. This delay could result in soggy fields during planting seasons, creating difficulties with field equipment. In addition, some fields require early planting, constraining growers' ability to delay.
- The implications of the preserves to rice yields. Preserves have unknown impacts on soil toxicity.
- The implications of the preserves to diseases, such as stem rot. It is unknown whether or not the preserves will successfully aid in soil incorporation, thereby acting to limit the incident of diseases.
- Constraints imposed by uncertain water supply and cost.

---

[5]Rice growers focus group, September, 1991.

Appendix F

Water Marketing

Appendix F

F.1 Water Marketing

By fits and starts, California is slowly inching towards a new era of water policy. In this era, water marketing -- matching willing buyers and sellers and allowing price to adjust to match supply with demand -- will begin to play a role in distributing the state's limited water resources. As the market develops, agriculture, with rights to roughly 85 percent of the state's developed water, will be a key participant.

Rice farmers are responsible for between 5 to 10 percent of statewide agricultural water usage. Over 2 million acre-feet of water are sluiced into California's rice paddies each year. Rice farmer participation in future water transfers could affect the dimensions of the rice straw disposal problem in a number of ways, as follows:

- As a result of a number of factors, the least of which may be the residue burning phase-out, rice farmers could choose to sell their water and fallow their fields. In this case, water marketing would reduce total rice acreage, and the volume of rice straw produced.

- Rice farmers may view water marketing as part of a comprehensive solution to their straw disposal problem. For example, if farmers increase fallowing to control stem rot and other diseases previously controlled by field burning, selling water during fallow years could offset the cost of longer field rotations.

- Rice farmers may be pushed into selling their water if the straw burning phase-out decreases crop yields to the point that growing rice becomes unprofitable. Though this is an unlikely scenario, some rice farmers have expressed the opinion that the straw burning phase-out is a subtle approach to taking water away from rice production.[1]

Regardless of the precise impetus for water marketing among rice farmers, selling their water provides growers with another potential mechanism to garner income in lieu of crop production. However, there are a number of barriers to the development of an active water market. These include the profitability of water marketing to individual farmers and institutional barriers to transfers. As will be discussed in the following sections, although water marketing appears to be an economically viable alternative for some rice farmers, institutional barriers make it unlikely that a significant number of growers will take advantage of potential marketing opportunities in the near future.

F.2 Financial Considerations: Water Marketing and Rice Production

Whether or not growers decide to sell their water is partially dependent on economic considerations. Farmers will participate in a water market if their return from selling water exceeds that from growing rice. Theoretically, if water marketing provides a financial return which is substantially

---

[1]Rice focus group meeting, September, 1991.

above that from growing rice, rice farmers will sell their water up to the point that a regional export limit is reached.[2]

F.2.1 Rice Production Costs and Income

As indicated in Chapter Four, total rice production costs range from $615 to $825 per acre. Individual grower's net income fluctuates depending on crop prices and yield variation. Since rice is part of the federal commodity program, the relevant price signal for a rice farmer is the target price associated with this program. This target price varies by year. For example, the 1990-1991 average target price was $10 per hundred-weight (Cwt). Given average production costs of $720 per acre, a target price of $10 per Cwt, and a yield of 80 Cwt per acre, the typical California rice growers earns about $80 per acre.

F.2.2 Water Marketing Costs and Income

Fallowing an acre of rice will yield about four acre-feet of water that could be sold.[3] Using the State Water Bank (SWB) purchase price of $125 per acre-foot as a proxy for a water market price, an acre of rice land fallowed for a water sale has a revenue potential of $500. Per acre fixed costs, including cash overhead, building and equipment costs, total about $300 per acre. At recent SWB water prices, a rice farm can earn about $200 per acre by selling water.

A portion of an individual grower's water marketing income would have to be paid to its local water district. For example, the farmer's water district would claim a fraction of sale revenue to cover district operating and fixed costs, including bond obligations. The share the district would claim is uncertain, and would vary by district, depending on cost structure.

From a financial perspective alone, as long as farmers can secure at least as much as their current per acre revenues from rice cultivation for selling their water, water marketing will be competitive with rice production. If the farmer's return from water marketing rises much above his current revenues, based solely on financial considerations water marketing would likely displace rice production.

---

[2]All proposed water market enabling legislation contains restrictions on total water exports from any particular region of the state, either by limiting the volume of water leaving a region or limiting the quantity of crop acreage that can be fallowed for the purpose of water transfer. Twenty percent of a water district's total supply appears to be the likeliest cap on exports.

[3] Nearly 6.5 acre-feet of water is sluiced onto an acre of a rice during a year. This water has three potential destinies: evapotranspiration, percolation, or outflow. Rice evapotranspires about 3.5 acre-feet per acre per year. An additional 1.5 acre-feet per acre percolate into the groundwater table, while 1.45 acre-feet flow back into the Sacramento River when the paddies are drained. Farmers will be able to sell water that cannot be claimed by a downstream user. This eliminates the 1.45 acre-feet headed for the river when the field is drained, as well as a portion of the 1.5 acre-feet that percolates into the water table but is recoverable. What remains for sale is the 3.5 acre-feet that would be transpired plus the portion of the 1.5 acre-feet that would be lost to deep percolation and not recovered.

F.3 Institutional Considerations Make Water Marketing a Distant Prospect

Although water marketing appears to be an economically feasible alternative for rice farmers, a myriad of institutional, legal, physical and environmental constraints are likely to act to limit widespread market participation by growers. Key constraints include the following:

- Under current policy most of the authority to make water trades resides with agricultural water districts, rather than individual farmers. These districts have been extremely reluctant to make water trades, and have acted to restrict individual farmers' ability to do so.

- The rice industry strongly discourages selling water at the expense of rice production.

- Environmental constraints -- including preparing exhaustive environmental impact reports -- makes transfer a lengthy process, discouraging participants from entering into a sale. Likewise, Endangered Species Act-related water flow requirements -- for example, to protect the Delta Smelt -- may act to limit surface water transfers.

- Physical constraints -- limits on water conveyances -- may preclude transfers from being made during certain time periods.

To date institutional constraints have overwhelmed the potential economic benefits associated with water marketing. While the above economic analysis suggests the financial incentive to sell water would exist as long as water prices approach $100 per acre-foot or more, the recent experience with the State Water Bank is a testament to the power of existing institutional constraints. Despite a sale price of $125 per acre-foot, only 1,110 acres of rice were fallowed for the Water Bank, less than one-half of one percent of planted acreage.

F.4 Likely Scenarios

Because of the significant uncertainty associated with when water markets will be fully functional and the ultimate level of rice farmer participation, the financial and economic analysis contained in this report is based on the status quo (i.e., no water marketing). However, it should be noted that in addition to simply removing rice from production, water marketing could have two subtle effects on rice straw management practices, as follows:

(1) Water marketing could be used as a means of improving soil incorporation outcomes. The problem with soil incorporation of rice straw is increased risk of disease (i.e., stem rot). One means of controlling stem rot and other diseases without field burning is to introduce a fallow rotation. In a fallow rotation a grower develops a growing cycle in which rice is produced during some years, while in others the field is allowed to remain fallow. Water marketing would enable some rice farmers to fallow their fields and still generate income from their land.

(2) Water marketing as a means to finance field fallowing. This scenario is very similar to the first one, except the farmer would permanently remove her field from rice production. As a result, it would result in somewhat different third party impacts.

Appendix G

Focus Group Participants

Appendix G
Focus Group Participants

Almonds

Privus Abraham, Livingston Farmers Association
Glenn Anderson, Anderson Almonds
Ray Harcksen, Northern Merced Hulling Association
Lonnie Hendricks, Merced County Farm Advisor
George Hughes, Mentum Huller Association
Joe Kollmeyer, Cortez Growers Association
Tad Kurosaki, Livingston Farmers Association
Susan McCloud, California Almond Board
Tom Nakashima, Nakashima Farms
Joan Pack, Livingston Farmers Association
Blaine Yagi, Yagi Brothers, Inc.
Doug Wells, Almond Grower

Rice

Mel Androus, Rice Research Board
Kati Buehler, California Rice Industry Association
Michael Daddow, Rice Farmer
Steven Dennis, Chairman, Rice Research Board
Don Heffren, Rice Farmer
Tom Jopson, Rice Farmer
Jim La Grande, California Rice Industry Association
Michael Sawdrock, Farmers Rice Cooperative
James Spangler, Rice Farmer
Robert Webster, Plant Pathology, University of California, Davis
Jack Williams, Sutter/Yuba Agricultural Cooperative Extension Agent

Walnuts

Walter Deardorff
Chas M. Gordon, Jr., Gordon Farms
James N. Haag, Haag Farms
Earl Lindauer
Joseph R. Marty
David Scheuring, Gold Oak Ranch
Bill Waggerhauser
Boyce White, Deseret Farms
Steven Wulfert, Diamond Walnut Growers Association

Wheat

Tim Chappell, John Kautz Farms
Neil Hamilton, H.H.&J. Farms
Frederick March, March Farms
John Mella, John Kautz Farms
George Tibbets, California Farm Bureau Federation